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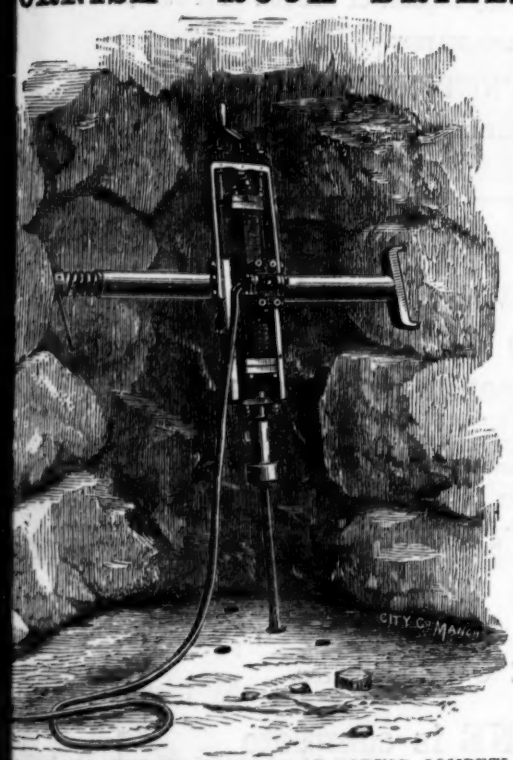

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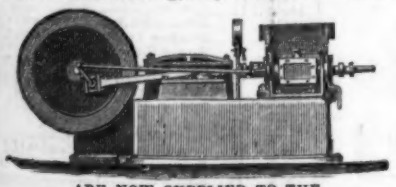

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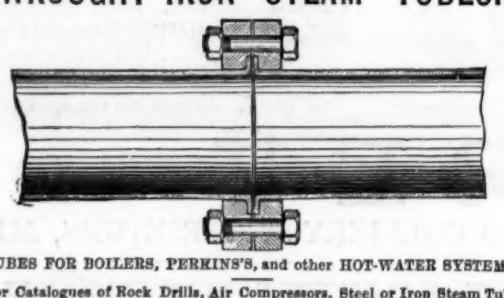

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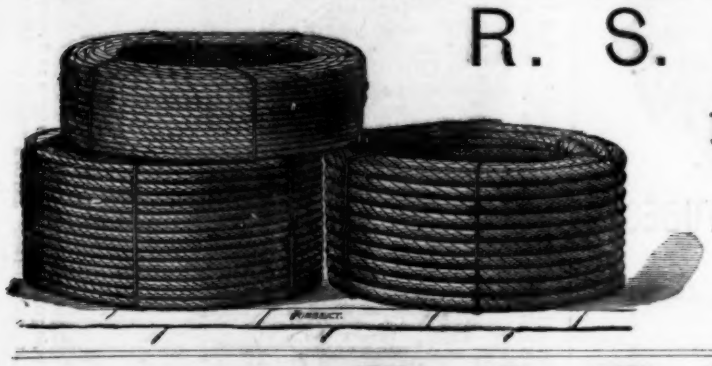

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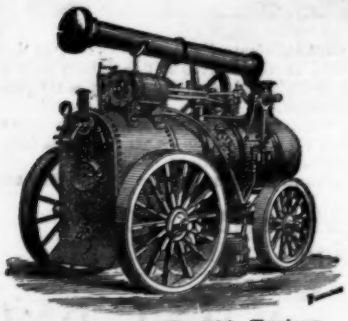

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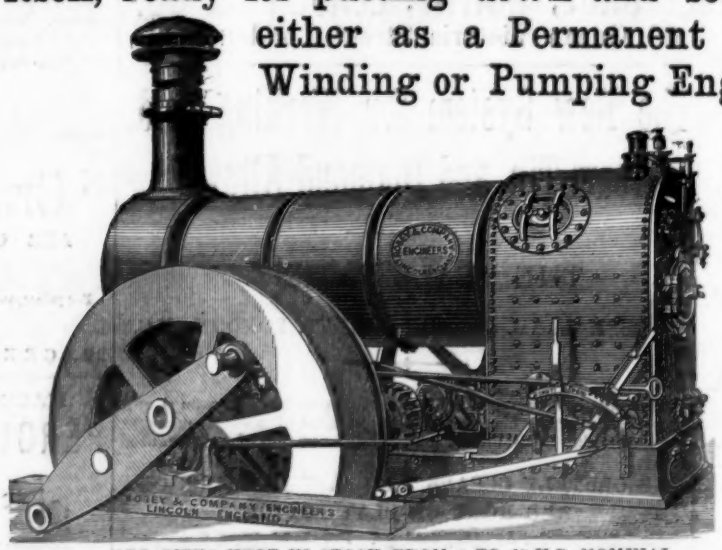

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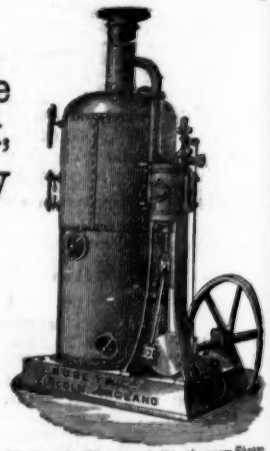

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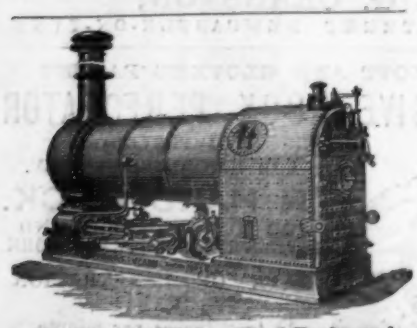

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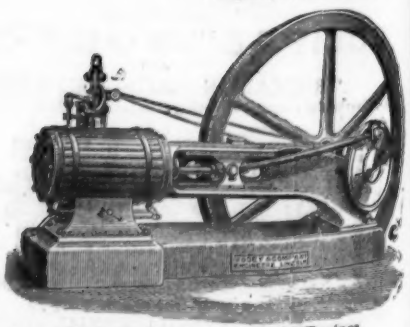

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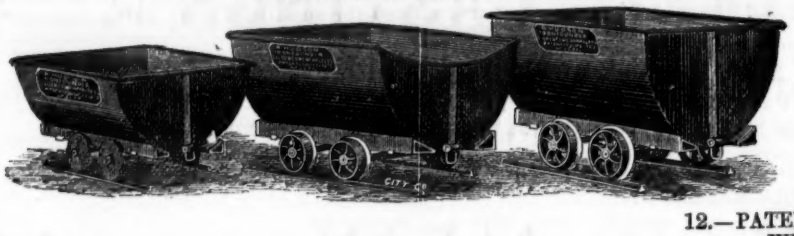
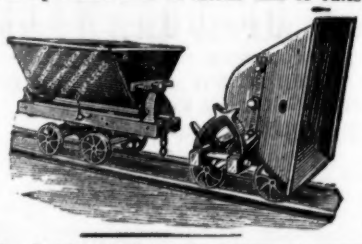
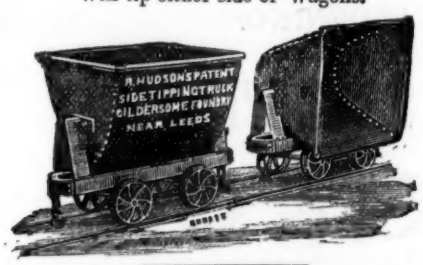


12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.

2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.

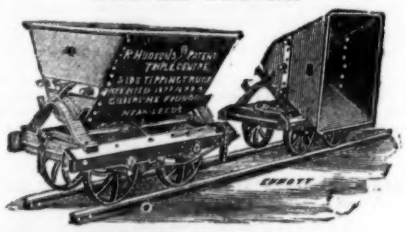


8.– PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.

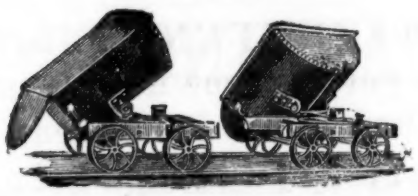


13.—PATENT STEEL HOPPER WAGON.

3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.



9.—PATENT STEEL ALL-ROUND TIP WAGON.



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(The "CATCH" can also be made SELF-ACTING if desired.)

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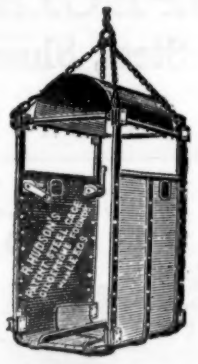
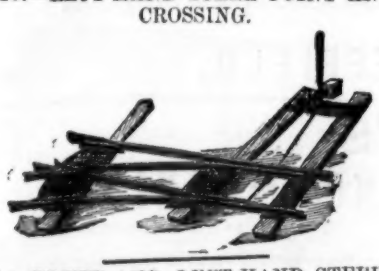


4. -PATENT STEEL PLATFORM OR SUGAR CANE WAGON.

10.—LEFT-HAND STEEL POINT AND CROSSING.



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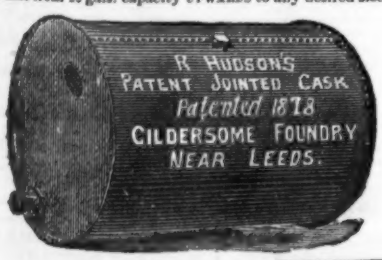
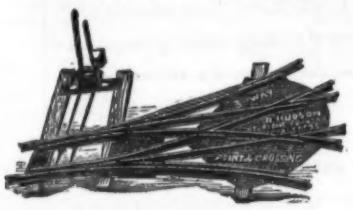


11.—RIGHT AND LEFT-HAND STEEL POINT AND CROSSING.



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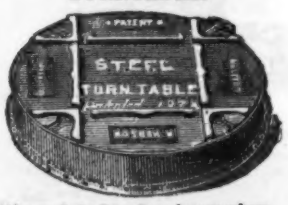

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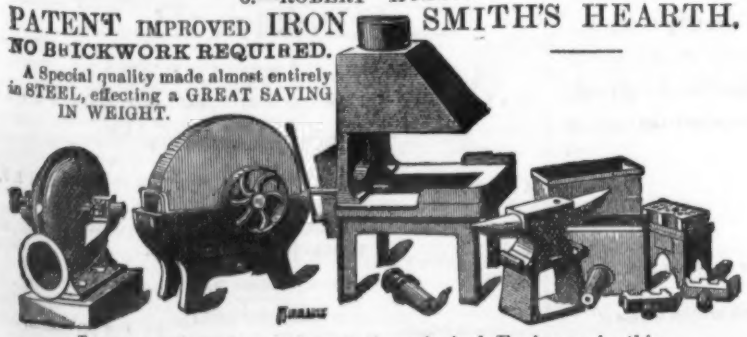

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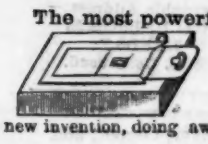

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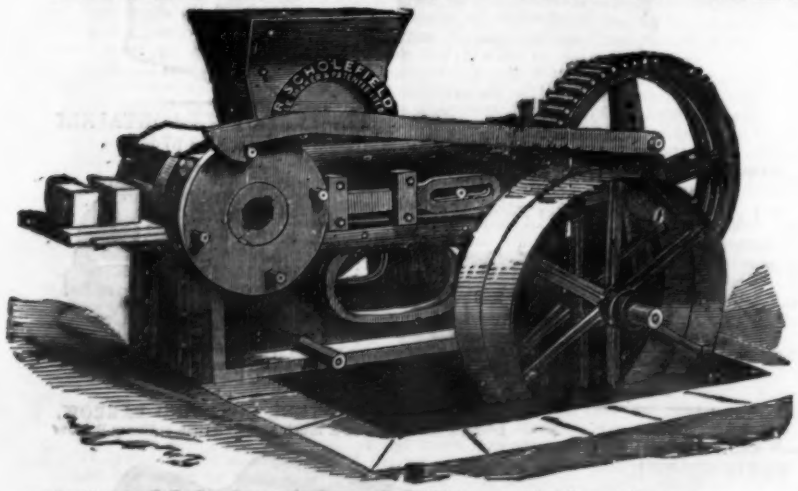

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2 men digging, each 4s. per day	£0 8 0
1 man grinding, 4s. 6d. per day	0 4 6
1 boy taking off bricks from machine, and placing them in barrow ready for the kiln, 2s. per day	0 2 0
1 boy greasing, 1s. 6d. per day	0 1 6
1 engine-man, 5s. per day	0 5 0
1 man wheeling bricks from machine to kiln, 4s. per day	0 4 0
Total cost of making 10,000 pressed bricks	£1 5 0, or 2s. 3d. per 1000.

(SETTING AND BURNING SAME PRICE AS HAND-MADE BRICKS.)

N.B.—Where the material can be used as it comes from the pit, the cost will be reduced in digging.

As the above Machinery is particularly adapted for the using up of shale, bind, &c., it will be to the advantage of all Colliery Owners to adopt the use of said Brick-making Machinery.

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JAMES FORREST, Secretary.

Institution of Civil Engineers, Great George street, Westminster, Oct. 28.

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For Papers Printed in the Proceedings without being Discussed.—1. A Telford Medal and a Telford Premium to Thomas Andrews, Assoc. M. Inst. C.E., F.R.S.E., for his paper "On Galvanic Action between Wrought-Iron, Cast Metals, and various steels during long exposure in Sea Water."—2. A Telford Medal and a Telford Premium to Francis Collingwood, M.Inst. C.E., for his paper "On Repairing the Cables of the Allegheny Suspension Bridge at Pittsburg, Pa., U.S.A."—3. A Telford Premium to James Henry Apjohn, M.A., M. Inst. C.E., for his note "On the Area of Sluice Opening necessary for the Supply Sluice of a Tidal Canal."—4. A Telford Premium to Thomas Gillot, M. Inst. C.E., for his paper "On the Basic, Open Hearth, Steel Process."—5. A Telford Premium to James William Wyatt, Assoc. M. Inst. C.E., for his communication "On the Art of Paper Making by the Machine, as exemplified in the Manufacture of high class Writings and Printings."—6. A Telford Premium to Wm. Santo Crimp, Assoc. M. Inst. C.E., for his account of "The Wandle Valley Main Drainage."

For Papers Read at the Supplemental Meetings of Students.—1. The Miller Scholarship to Alfred Richard Sennett [has since been elected an Assoc. M. Inst. C.E.], Stud. Inst. C.E., for his paper "On the Electric Light.—2. A Miller Prize to Peter Chalmers Cowan, Stud. Inst. C.E., for his notes "On the New York, West Shore, and Buffalo Railway, and the Methods used in its Construction."—3. A Miller Prize to Walter Osman Rooper, Stud. Inst. C.E., for his account of "Emery Wheels and Emery Wheel Machinery."—4. A Miller Prize to Richard Moreland (*tertius*), Stud. Inst. C.E., for his paper "On Constructional Ironwork for Buildings."—5. A Miller Prize to Edward Woodrowe Cowan, Stud. Inst. C.E., and a Miller Prize to James Faweus, Stud. Inst. C.E., for their joint paper descriptive of "A Light Draught Launch."

QUEENSLAND GOLD MINES.

SIR,—Charters Towers is not anything behind its Southern rival, as witness the facts that for the week ending Aug. 20 the banks purchased 1869 ozs. of gold, and in the following week the quantity reached was 2693 ozs. The Day Dawn p.c., as usual tops the list. The three crushings during August were 300 tons for 549 ozs. gold and dividend of 1s.; 490 tons for 1015 ozs., and dividend of 2s.; 570 tons for 1352 ozs., and a dividend (the 68th) of 3s. September has opened with even better results. A telegram received yesterday intimates that 620 tons yielded 1508 ozs. gold, with a 4s. dividend. The record attached to the history of this mine is, indeed, of great brilliance. The Day Dawn and Wyndham Block have also done well, as witness their latest crushing of 266 tons for 605 ozs. St. George's p.c., with 231 ozs. from 76 tons, is another splendid record, and affords an admirable example of the character of the mines on this field.

A discovery of gold was reported from Crow's Nest, in the vicinity of Toowoomba, but up to the present nothing very profitable has been done. The heavy yields at Mount Morgan, Rockhampton, continue. A large quantity of ore is being raised in the Herberton district, and good work is being done in all the mines. At Maryborough a movement has been set afoot to prospect the district for gold, and the Government has promised to assist it by granting 2*l.* for every pound locally raised. Crushing is going on briskly at the Gilbert, and good stone is being raised. News has arrived from the Normandy gold field of a very satisfactory nature. The Woolgar, Hodgkinson, and other fields report up to the average.

With regard to the Mount Morgan Gold Mine the news is most encouraging. During his recent trip to the Northern ports, says the Gympie Times, the member for Gympie, in company with the Mayor of Rockhampton, Mr. Ferguson, M.L.A., and Alderman Wakefield, paid a visit to the celebrated Mount Morgan Mine, in which, by the way, a popular ex-Gympieite, Dr. Benson, has a good fortune to hold an interest.

Mr. Smyth, in the notes of his visit, which he has kindly supplied, says:—The mine is about 26 miles from Rockhampton. Crossing the railway line at Gracemere township, the road trends about south-west, and for 20 miles is good. The usual custom is for two persons to go in each buggy, taking a saddle add bridle for each. At the foot of the range, 20 miles from town, the horses are taken from the conveyance, the saddles put on them, and the horses led up a very stiff hill, from the bottom up to the top of which is, I should think, about 300 yards. A ride of 6 miles over a fair road then brings you to the company's property. There are two machines, one of 10 and the other of 15 stamps. They are at the head of the Dee river, and at present have only a limited supply of water, not much rain having fallen in the locality lately. The dam is made of concrete, and is a very substantial one. At the machines immense heaps of stuff are stacked for crushing. From the machines to the top of the mountain is, I should think, ¾ mile, the latter portion very stiff climbing. Large boulders of what looks like ironstone are scattered about the top of the mount. A face is working near the top, which in the deepest part is about 30 ft., and gets higher as it advances. A computation has been made of the quantity of crushing stuff contained on this level, and the result is 450,000 tons. The face looks like a mass of ironstone, with veins of porphyry there and there through the mass; about 60 ft. below this there is another face working, and the material seems much the same as in the upper level. The stone is easily worked, being full of open joints, as if the whole hill had been shattered. I was informed the breaking of the stone and carting it to the machines cost about 6*s.* per ton; the cost of crushing will be about the same. The value of the retorted gold being 4*l.* 0*s.* 10*d* per ounce in Rockhampton, 3 dwts. to the ton pays for breaking, carting, and crushing the stuff. What the yield is I cannot say, but gold can be seen in the face of the work, and with a magnifying glass some of the stone appears to be peppered with gold of a shotty appearance. Rumour says that as much as 12 ozs. to the ton has been obtained from the battery, which I can quite believe after examining the stone; but I was told by one interested that the yield has not been less than 3 ozs. The tailings are all stacked for future treatment, and are said to be worth from 4 ozs. to 6 ozs. to the ton. Mr. Lymburner is superintending the erection of large works for treating the tailings by chlorination. It is quite evident from the nature of the stuff that a very large amount of gold passes over the tables. The value of the mine may be imagined by the prices paid to the Messrs. Morgan. One of the brothers was paid 62,000*l.* for his interest—one-third of the mines. Since then the other brother has been paid 31,000*l.* for one-ninth of the property, the purchasers in both cases being shareholders in the mine. The amount paid was small, even supposing the yield was only 1 oz. to the ton. It is I understand the intention of the holders to erect 100 heads of stamps, which they will b quite justified in doing with this mountain of crushing stuff to operate on. A great deal of money will have to be expended in constructing dams and in the erection of stamps, the timber for construction being scarce in the locality; but with a regular return from the present 25 head, the expense of providing additional appliances will not be much to take from the profits of the returns. I think the shareholders of the Mount Morgan Mine have the most valuable mining property in the Australian colonies. They are men of energy, and that they will develope the mine with all speed is proved by the amount of work already done—in some cases under great difficulties. I was kindly presented with specimens of the rock, as I wished to show it to the miners here, so that they might know similar stuff should they be fortunate enough to find any. The stone may be seen at the Mining Exchange.

The list of crushings at Gympie during August shows an average yield of 1 oz. 12 dwts. of gold from the ton of ore crushed, the figures being:—No. 1 North Phœnix, 1725 tons, yielding 2187 ozs. gold; Wilmot Extended, 291 tons, yielding 1434 ozs. gold; Ellen Harkins, 149 tons 2 cwts., yielding 488 ozs. gold; No. 1 South Wilmot, 151 tons, yielding 1278 ozs. 10 dwts, gold; Nos. 3 and 4 North Glanmire, 572 tons, yielding 432 ozs. gold; No. 5 North Phœnix, 193 tons, yielding 250 ozs. gold; Nos. 2 and 3 South Smithfield, 479 tons 3 cwts., yielding 395 ozs. gold; Phœnix p. c., 647 tons, yielding 636 ozs.; Nos. 7 and 8 Monkland, 300 tons 15 cwts., yielding 144 ozs. gold; North Glanmire, 100 tons 10 cwts., yielding 123 ozs. 10 dwts gold; South London and Bristol, 8 tons 6 cwts., yielding 60 ozs. gold; Jones and Otago Extended, 15 tons 18 cwts., yielding 4 ozs. 10 dwts. gold; Dawn Extended, 16 tons, yielding 7 ozs. 16 dwts.; = 4648 tons 14 cwts., yielding 7440 ozs. 6 dwts. gold. N. B.

Brisbane, Sept. 10.

SILVERTON, NEW SOUTH WALES.

SIR,—The richness of some of the specimens of silver ore, and the large extent of mineral-bearing country prospected by miners at Silverton, induced the Government here to send up Mr. Wilkinson, F.G.S. (the head of the geological staff), to inspect and report on it; and as it is very likely that some of the mines there may be offered for sale in England on a private report, it may be useful to some of your readers to know exactly what Mr. Wilkinson's official report says. I may also add that, not only does he know what he is writing about professionally, but that he is likewise a gentleman of unimpeachable character and reputation, so that his report may be absolutely relied upon as being written without fear or favour. have, he says, examined 81 lodes, and there are a few others, the Day Dawn, Ophir, Black Prince, &c., that I did not see; but those described include all the principal ones, and from them it will be seen.

1. That the geological formations which contain the argentiferous lodes of the Barrier Range silver field are mica schists, clay-slates, and sandstones, traversed by numerous quartz reefs, and intrusive masses and dykes of coarsely crystalline granite (pegmatite) and diorite. Nearly all the lodes occur in the mica schists, and they have been found over a tract of country 70 miles long and 30 miles wide, which has been only partly prospected, so that many more lodes will probably be discovered. But the metalliferous formations are known to occupy a much larger area and extend to Kooringbury on the north, and on the east as far as the eight-mile tank on the road to Silverton, about 38 miles from Wilcannia.

2. That the lodes, with the exception of those of the Broken Hill and Pinnacles, which are chiefly composed of ferruginous quartzite, all consist either of brown iron ore (gossan) containing argentiferous carbonate of lead and galena in bunches, and sometimes chloride and chlorobromide of silver and carbonate of copper, or, rarely, of argentiferous carbonate of lead and galena alone; quartz is sometimes though not always present, and in one instance baryta occurs. It is evident that the oxides, carbonates, and chlorides have resulted from the decomposition of the sulphides, and perhaps arsenides of iron, lead, silver, and copper, &c., which will be met with in their original condition below the water level; sulphide of lead (galena), and in two instances iron pyrites are even found above the water level. I did not notice any distinct sulphide of silver, iodide of silver, or antimonial ores in the lodes; however, I have collected certain samples of ore for analysis, but they have not yet reached Sydney. Mr. J. Cosmo Newbery, C.M.G., superintendent of the Technological Museum, Melbourne, reports having found chloride, bromide, and iodide of silver, with brown iron ore, carbonate and sulphide of lead, oxide and sulphide of antimony, and traces of bismuth, in the ore from the Christmas Mine. It is stated that 12 cwts. of this ore, treated at the Victorian Pyrites Smelting Company's Works yielded 2575 ozs. of silver. In one mine, the water level has been reached at a depth of 133 ft., in another at 72 ft., but no lode has yet been mined below the water level.

3. That the lodes without exception are very inconstant in thickness, both in longitudinal and vertical extent, and many of them thin out entirely within a few yards. A surface plan of the numerous lodes would resemble the shrinkage cracks upon the surface of a dried piece of cross-grained wood; in fact, as before mentioned, the lode fissures were shrinkage cracks formed by the contraction of the rock mass after the intrusion of the igneous rocks. Some of the lodes appear to have been formed along an original joint in the strata, which is indicated by a well-defined wall in the lodes, and these will, I believe, continue to great depths, though varying in thickness in places. There is, therefore, a probability that silver and lead mining in this district will be a permanent industry.

The question of water supply for the district is of paramount importance. Naturally there is no permanent surface water; but there are sandy alluvial vats in some of the larger valleys in which underground streams are likely to be found capable of affording a supply of fairly good water. Where the water circulates, as it must do in places, through the alluvial deposits, it will probably be of drinkable quality, though always a little brakish; but where it is stationary it will be too salt for use, so that it may be necessary to put down several shafts or bores across the alluvial flat before the lines of fresh water be struck. The principal localities where such water may be obtained, and where it will be most required, are at Silverton, in the wide flat on the north-east side of the town, the flats near Wilson and Purnamoota, Stephen's Creek, near the Mount Gipps Hotel, on the main road to Wilcannia, the creek near the Pinnacles, and in another creek on the north-east side of Round Hill. The supply, however, from the drifts near Wilson and Purnamoota may not be permanent, as the drainage areas of the valleys are not large. The Thackaringa Mines are situated among rocky hills and short gullies. At the Thackaringa sheep station a well has been sunk 236 ft. deep, where a gully opens out on to the great plains, but only a small supply of good water was obtained. Therefore a permanent supply for the mines must be secured by making a large and deep tank to conserve the rain water, or by sinking a well from 300 ft. to 400 ft. deep on the plains, five miles west from the mines. Large tanks should also be made at Silverton and in the other localities above named for they would be more convenient than wells, and the water in them will be of a fresher quality. Though the average rainfall of the district, according to the returns of Mr. Russell, Government Astronomer, is only 9·4 ins., yet it is sufficient to fill the largest tank. In the channel of one of the creeks I observed flood-marks 12 ft. above the level of its sandy bed, and where the channel is about 150 yards wide. Mr. Barlow, the district surveyor, told me that the rain which fell in June for a short time flooded the low-lying part of the town of Silverton. Elsewhere I also saw evidence of the large quantity of water that must at times flow rapidly off the surface. I believe that artesian water would be obtained by boring into the cretaceous formation underlying the great salt-bush plain between the Barrier Range and the South Australian border, and within 30 miles north-north-west from Silverton. Mr. Brodribb, of Poolamacca, is sinking a well in this locality. It is now down 280 ft., and some fair stock water has been met with, but at a greater depth for a strong supply of good water will doubtless be struck.

Timber for mining purposes is very scarce in the district, and will soon have to be imported. The nearest place whence it can be procured is the country bordering the Darling river. The next important question affecting the development of the lodes is the means

of transit of the ore to smelting works. A crushing plant is now being erected at Silverton by Mr. Thompson, and it will be a great boon to miners in enabling them to have large parcels of ore accurately sampled for assay and valuation. But the ore generally contains a large proportion of lead, and, therefore, it will require to be smelted, and this cannot be conveniently done on the field, owing to the scarcity of suitable fuel. At present it is carried to a distance of from 298 to 330 miles at a cost of 5*l.* per ton, to Adelaide, for shipment to England or Europe; whereas, if a line of railway were constructed from Silverton to Menindie, a distance of only 76 miles, it is obvious that the ore would eventually be sent there for treatment, seeing that there is abundance of timber of the best description for fuel near the Darling in the Menindie district, and with ore, fuel, and water available there is no doubt that smelting works would soon be established. Timber for the mines could also be supplied from here at a much less cost than from Adelaide. The reduced lead and silver, &c., could then either be sent to Sydney, or, *via* the Darling, to South Australia or Victoria. But whichever way the production of the metals be transmitted to market, it is evident that the construction of a light line of railway from Silverton to Menindie would not only be one of the chief means of promoting the development of this mining field, by lessening the cost of treatment of the ore, and affording facilities for quick returns by the smelting being carried out so near to the mines, but also the improvements which would consequently be made in the locality would materially increase its value, and the new industry which would arise would be retained in the district, to the great advantage of the colony. Should coal or coke at any time be required, it could probably be supplied from Dubbo, for I am of opinion that workable seams of coal will be found near Dubbo, and when the proposed line of railway is constructed to Wilcannia coal could be conveyed there by rail and thence shipped down the Darling to Menindie.

The geological features of the country outside of this mining district that I travelled over from Hay *via* Wilcannia to Silverton I will describe in another report.

Although the mines are in New South Wales, yet they are so much nearer to Adelaide and Melbourne than to Sydney that nearly all the investments in them are made by speculators from the two first-named cities, and very little Sydney capital has yet been sunk there as yet; but, then, we have the Moruya, Michell's Creek, and Boorook Silver Mines to distract our attention, and all three of them much nearer home.—*Sydney, Sept.* 3. R. D. A.

DIAMOND MINING—NEW SOUTH WALES.

Sir,—There seems no reasonable doubt now of there being not only diamonds of a mercantile value, but also in paying quantities in New South Wales, as the following report from the Bingera district proves, although the machinery has only just set really to work. Advices (Sept. 13) say:—The returns from the diamond mines are most encouraging. The Australian Diamond Mining Company have just finished washing 279 loads of wash dirt, which yielded 920 diamonds weighing 197¾ carats. The want of sufficient water is seriously retarding operations, and the machinery has only been at work for three-quarters of an hour each day. With a proper water supply that quantity of wash could be put through in one-and-a-half day.

Also, there now comes news of a fresh discovery (in a quite unexpected quarter) in the southern district, close to the railway line, and within 100 miles of Sydney, which fairly bids to be superior even to the better known Bingera rush, so far as we can judge at present. Advices just received from Bowral says:—Four parties have applied for 20-acre leases of the ground on the Mittagong gold field. One of the applicants is an ex M.L.A. The applicants say that it is their intention to dig for diamonds and other minerals. A Mittagong correspondent (Sept. 9) writes that about eight years ago two men named Smith and Boyle while prospecting for gold discovered two stones which were afterwards found to be diamonds. Although every search was made to trace these men they could not be found anywhere. Consequently the exact spot where the stones were found remained unknown until recently, when two more prospectors found two diamonds and one sapphire in the drift of a creek about 3 miles on the other side of the Nepean river, and about 7 miles from here. These stones were taken to Sydney and tested, and pronounced to be diamonds of the first water, and of the value of 15*l.* to 25*l.* The sapphire by weight would have been worth 400*l.* but for a small cloud in the centre of it. It is of an immense size, and very brilliant. After this became known preparations were made to obtain suitable boxes for washing the diamonds. The result shows that although the tailings of the old prospectors only were washed the wash dirt was full of diamonds of various sizes, and also of zircons and rubies, and gold sufficient to pay well. There is an immense tract of country similar to that in which the diamonds have been found with plenty of water. Already people have come from Goulburn and have taken up ground, and are working it, and a rush is expected, although not wanted by the people here. A mining expert says that it will be one of the richest fields in the colony for gold and diamonds. I washed a dish on Saturday last, and although I took the wash dirt promiscuously, and washed but one dish, I got four small diamonds, one ruby, and three specks of gold. The diamonds were small but perfect, being octahedrons.

My old friend, the late Rev. W. B. Clarke, the well-known geologist, always predicted that we should open valuable diamond mines, with careful prospecting, as the colony had all the necessary geological features to assure the existence of all the more valuable gem stones.

Sydney, Sept. 16. R. D. A.

GOLD COAST MINING COMPANY, WASSAU.

Sir,—In my letter inserted in last week's *Mining Journal* I remarked, in concluding, "That the crushing has not been 10 tons per day from the 36 heads of fire-stamps." Mining to be legitimate should be consistent with the prospectus issued, otherwise one of two conclusions are likely to be arrived at by the adventurers. The prospectus is overdrawn, and is virtually a South Sea bubble, or that scarcely one-sixth of the gold recovered at the mine is accounted for to the shareholders, more than five times that amount going into some other channel. We cannot, however, accept the proposition as applicable to the prospectus, inasmuch as there are honoured and esteemed names connected with it, who have given their opinion with care and judgment. As to the latter it remains with the 300 shareholders to make a searching and careful enquiry.

The first statutory meeting, which took place in May, 1882, was prior to the issue of the prospectus. The whole of the share capital was *bona fide* issued. The number of shareholders were about 300, the calls being paid up to that time; therefore, the capital was considered satisfactory. The property of the company was taken over from the vendors on July 1, 1882. The Chairman in his remarks at the September meeting, 1882, asked this pertinent question, Had they a property? Upon that point they must bear in mind that this was not an idea taken up by a number of speculators, but the company became possessed of this mine from gentlemen of the highest commercial standing; therefore, the property was an actual fact, and those gentlemen had sold it to this company. Those gentlemen had not parted with their interest in the company, but still held largely. The property consisted of two mines, called Crockerville and Aja Bippa. Crockerville had more done to it, with machinery fixed for crushing ore; but Aja Bippa possessed features which held out prospects for a more immediate yield of ore, but there was no machinery on that mine. The duty of the directors was to develope those mines, and to erect such machinery on both mines in order to make them complete. He further stated that from the Aja Bippa Mine the directors had received 43·63 ozs. of fine gold from 25 tons of stone, equal to 46·597 ozs. of standard gold, which was sold at 77s. 9d. per ounce. Up to this 15s. had been called up on the shares, which was said would pay all the purchase money, and provide the funds necessary to put up the machinery for the working of the mine. Mr. Crocker, in reply to questions, stated that they had always had more men than they wanted, and they were paid 36s. per month, and found their own food; that they had put in an additional shaft on the Aja Bippa Mine (making four in number to this date), and gone down 60 ft. with the shafts on all the lodes. They struck the lode in some places at from 4 to 6 ft. from the surface. There was no trouble with the water in the shafts, as they were driving an adit. When the adit was in, and they began to open out and stope, the output would increase rapidly.

At the meeting held in April, 1883, I further gather that the new machinery, which cost 3303*l.* 13s. 1d., will be considerably increased by the expenses of transit and erection at the mines. When that is done we shall know exactly what the total amount will be transferred and embodied with the 75,000*l.*, cost of our property. This will represent the value of our estate on the West Coast of Africa.

The Chairman states—"If we were to take (say) 25 tons per day as an estimate of the output, the ore maintaining its present average quality, which I have no doubt it will, the value of the gold extracted would be about 4500*l.* per month. The gold is of rich quality; its average value hitherto has been 4*l.* 1s. 9d. per ounce, and the yield from the ore shows that it has produced 7*l.* 0s. 5d. per ton of stone. The salaries—payments to agents at Axim, including the native labour—will from this time amount to about 420*l* per month. We have altogether a very efficient staff for the work at present in progress. We are able to obtain native labour as we require it, and there is no doubt that we shall be able to continue to do that; and we can get no better labour than from the men who live in the country, provided that they are properly superintended by Europeans."

Helston, Oct. 27. N. R. H.

BELT COPPER MINING COMPANY.

Sir,—Perhaps at the present time, when this company is pressed with financial difficulties, the shareholders may wish to hear an opinion of their property, formed, as it is, after six months' acquaintance with the locality, and (in the first) the mines themselves.

Undoubtedly the price paid for these mines was very excessive, and on this point I shall make no comment. Secondly, the Penn, situated about 4 miles from the Bohemian and Great Western, where the officers and majority of the men live, and still nearly 3 miles from the stamp-mill, is too distantly placed for it to be worked in connection with the other mines, even if the limited openings on its small area warranted this under other circumstances. If there was anything to be gained by selling this mine this should be done at once. The Bohemian, on which the shareholders were led to build their hopes, and on which a great amount of unproductive work has been done and money spent by the present company, was never a promising mine. The Champion vein, as they call it, deriving its name more from an allusion to its width rather than from its copper-bearing qualities, I have watched carefully, and have seen ton after ton of the rock hoisted from this lode, and the poorness of the vein-stuff demonstrated, even when every proper allowance has been made for trap.

Probably the most deceptive way of judging the richness of one of these native copper veins is by the appearance of the drifts, the heavy copper from its tenacity being left conspicuously clinging to the roof and elsewhere, the process of blasting having broken away the surrounding rock, and left the copper exposed. Generally speaking the Champion lode is ill defined, and I consider the intrusion of trap spoken of in the engineer's report as only another confirmation of this. On the other hand, the company without doubt have a mine worth working in the Knowlton, and when I returned from there 12 months ago the openings gave great promise. There was a good deal of barrel and stamp copper taken out, considering they were only doing dead work, and I see no reason why it should equal the well known lode of which it is a continuation. Besides these other well known veins extend through the property. Thus, then, I am of opinion that the Knowlton lode properly worked might retrieve the hopes of the shareholders. I might, could I venture to trespass on your space, speak of the wages, management, value of machinery, and other points, but I prefer to confine my remarks to the property itself, without entering on other issues. H. G. Blyth, A.R.S.M.

Emperor's Gate, Oct. 24.

FREE TRADE v. RECIPROCITY.

Sir,—"Reciprocity" and other of your correspondents have recently discussed at considerable length in the columns of the *Mining Journal* the comparative merits of Free and Fair Trade. For educational purposes such discussions are very valuable, but in order to achieve practical results action is necessary. I, therefore, do not propose to occupy your valuable space in further discussion, but would ask you to allow me to inform your readers that the National Industrial Association is being formed for the defence of the agricultural, mining, and manufacturing interests, and we shall advocate the imposition of an import duty on copper, tin, and lead unless imported from a British colony. British mining cannot be said to have flourished satisfactorily under the Free Trade system; let us, therefore, give reciprocity a trial. I, for one, believe that British mining would be greatly benefited under the fostering care of an import duty. George Brown, Hon. Sec.

Gibson-square, Oct. 29.

[Although as anxious as Mr. Brown can possibly be to defend the interests of the mining and manufacturing industries, we think it has been satisfactorily demonstrated that "the imposition of an import duty on copper, tin, and lead unless imported from a British colony" would be not only undesirable but especially prejudicial to the working classes of this country, and would afford no relief whatever to capitalists or mine shareholders; we should, therefore, consider the National Industrial Association not in any way worthy of support. Already foreigners can successfully compete with us in foreign markets of which we previously had the monopoly, and anything such as an import duty upon metals, which would still further increase the cost of production of manufactures in this country, would take still more trade away from us. As to British mining not having "flourished satisfactorily" under the Free Trade System, the contrary is shown by published statistics to be the fact. Since Free Trade was adopted British mining has enjoyed periods of greater prosperity than that at any previous time. At present we are suffering from a serious depression it is true, but this will prove as former depressions' merely temporary; in fact, the worst seems to be now past, and if working men be not too exacting with regard to wages and capitalists take advantage of present low prices to make judicious purchases both will derive far more benefit, and much more quickly, than would be likely to result from any attempt to return to Protection absurdities.—Ed. *M. J.*]

SCIENTIFIC HOODLUMS IN A SCHOOL OF MINES.

Sir,—We are accustomed to view with comparative lenity the pranks of college boys on the plea that they are boys. A lot of young fellows who have not yet developed a manly character or decided upon a manly purpose and career in life are sent by their parents to take the academic course in an American college, that they may be trained into the qualities which they lack. If they engage with zeal in competitive games we are glad of it, even though they carry their enthusiasm now and then too far. If not satisfied with base-ball and foot-ball and boat-racing, &c., they go into "rushing" and "hazing," and whatever other forms of childish barbarity they choose to dignify with slang names, we reprove or punish them according to the degree in which they break the peace, destroy property, or cruelly maltreat their weaker victims. But we still say, "Boys will be boys; they will outgrow these silly and brutal ways, and anyhow this is a part of the time-honoured system, out of which, as we know, good and great men have been developed." Even in ordinary colleges there is no doubt, nevertheless, that the firm suppression of such abuses by the governing body would be wholesome and wise. The spectacle of a college faculty with nerve enough to send home a whole class for wanton violation of law and order and decency would be refreshing to parents and to patriots. But while our colleges are engaged in a keen competition for students, and are in larger measure dependent upon their fees for support, it is perhaps too much to expect that this Roman sternness of discipline will be maintained.

The case is different in technical schools. The young men in these schools have chosen their vocation, and addressed themselves in earnest to their life-work. They are enjoying the advantages of instruction and aids to instruction, costing much more than the fees they pay. They are allowed in many respects a larger liberty than academic students. If they descend to imitate the puerile follies and the brutalities of college boys they should not be so easily excused. These observations are called for by the recent events and the present situation of affairs in the Columbia College School of Mines, where the undergraduates are indulging in tearing one another's clothes, punching one another's ribs, hooting and cat-calling, and hurrahing for '87 or '88, or some other date. . . . This spectacle is presented by young ruffians who in a few months will be asking to be put in charge of important interests, involving a knowledge of sciences and laws and men, and the rights of person and property. Is it likely that business men will trust them to-morrow if to-day half of them ought to be spanked and put to bed, and the other half clapped into the Tombs?

No doubt there are students at the School of Mines to whom these strictures do not apply. They are involved in unmerited disgrace by the behavior of the cubs who howl and tumble about the place. They have our sympathy and pity; and if they will come out in a manly way, to disclaim all connection with the silly rowdyism of their classmates, they shall have also a recognition from us that will be of substantial value to them in their professional careers.

Closely connected with the evil we have described is the practice of "cribbing." Both of them are rooted in a common feeling or lack of feeling, to wit, a frivolous view of the technical course of training. The youngster who looks on the School of Mines as a place for class-sprees will also consider a lesson as something to be shirked, and a teacher as "fair game" for deception. It is an open secret that the Professors at the School of Mines have had a good deal of trouble with "cribbing," and that it has not been wholly suppressed. In other words, one of the most admirable and complete institutions of the kind in the world, manned by a corps of able instructors, munificently endowed and wisely planned, is crippled in its efficiency, its instruction partly wasted, its degrees impared in value and dignity, its usefullness imperiled, because a lot of hoodlums, who do not appreciate what is done for them and what is required of them, choose to turn science into mockery. If a gang from the slums should mob the School of Mines, everybody would be disgusted and indignant. Is it any better, when the mob is within instead of without?

We sincerely hope that President Barnard and the authorities of the School will put down the practices we have denounced, and extinguish the spirit out of which they have sprung, if the buildings have to be emptied of students to do it. . . . The fools in the School of Mines are picking up the cast-off toggery that Harvard and Amherst and Williams and Yale and Cornell have—some of them completely and all of them to some extent—outgrown.

Rossiter W. Raymond, Ph.D.

—In *New York Engineering and Mining Journal.*

WELSH LEAD MINING STILL PROFITABLE.

Sir,—Now that operations are about to be resumed at the famous Van Mine it may be interesting to many of the readers of the *Mining Journal* to know that the total receipts from the commencement in 1845 to 1884 from the produce, comprising nearly 70,000 tons of lead and 25,000 tons of blende, have amounted in value to 1,000,000*l.* sterling, and out of that amount there has been paid in dividends 380,000*l.* or thereabouts. It is stated on eminent authority that there is yet a large quantity of mineral in the mine, and if lead were a very little higher in price handsome returns would again be made to the shareholders.

As stated officially the primary object of the working about to be commenced by the reconstructed company is to push forward the trial at Edward's shaft, with a view of cutting the deposit of mineral from which the above quantities of lead and blende were returned at a greater depth. In the bottom of the old workings the ore has been proved to continue in depth, so that there is every chance of the trial proving successful. Should this be the case even at present prices the shareholders will not regret having put their hands into their pockets. There are many advantages at Van. There is dressing machinery as complete as any in the world, if not the most complete. The mine is laid open in a minerlike and substantial manner; there are many points where mineral is in sight, and many other advantages could be mentioned, but my belief is that the time is not far distant when the mine will tell its own tale. As a shareholder I feel almost convinced that everybody interested will be amply repaid for their outlay. I have been told by a miner of practical experience, and one who knows the mine, that before long the concern will once more take its place in the front rank of lead and blende producing mines in the United Kingdom.

The price of lead has at last taken a turn. Pig-lead has made an upward movement since the last sale of Van ore, and it is generally believed that the price will still go better. In looking through the reports and balance-sheets issued from time to time I find that upwards of 21,000*l.* has been spent in plant, and I am informed that the same is in excellent condition; and by studying the present position of affairs, the prospects in the near future, the fact that all the new capital has been subscribed for, &c., I find the Van certificates of shares are not mere slips of paper, but are exceedingly valuable, and should be looked up, examined, and enquired into. The figures used in this short note have been extracted from the statements of account issued from the first, and which are in possession of a brother shareholder. I have great hopes of Van, and fully expect to hear that profits are being made at a very early date. A. S. I.

New Broad-street, Oct. 23.

CORNISH MINING IN 1879 AND 1884.

Sir,—The most disastrous year for mining within the memory of man was in 1879, when metallic tin was 65*l.* per ton, and the prices of mine shares equally depressed; but ere the close of that year tin was at 95*l.* per ton, and the rapidity with which the price of shares went up may be understood from the fact that South Condervon shares at the opening of that year were 10*l.* each, and at its close 15*l.* each; South Frances were 6*l.* each, and at the end of the year 12*l.* each, advancing to 18*l.* two months later; Carn Breas were 30*l.*, and advanced to 95*l.*; Dolcoaths were 26*l.*, and advanced to 70*l.*; Tincrofts were 9*l.*, and went to 30*l.*; East Pool were 9*l.*, and advanced to 40*l.*; while West Basset went from 4*l.* to 17*l.* 10s; the aggregate advance of these seven mines (which are a small portion of those to be enumerated), in that short space of time, being 717,000*l.* In the interest of Cornish mining it is only fair to say, during the last few years (and the present year of depression particularly) many of its mines, from being well directed, have so improved during their progress, that they only wait the reaction looming in the metal markets to repeat the history of that memorable year. Some half-dozen or more mines might be named having only a nominal price of a few shillings per share, stand to rise to as many pounds within the next six months. The apathy of the public in times of depression and their disregard of the future often prevent easily acquired wealth.

St. Day, Scorrier, Cornwall, Oct. 29. Charles Bawden.

CORNISH MINING—TRESAVEAN v. DOLCOATH.

Sir,—I may perhaps not be considered intrusive if I solicit space for a few remarks on the comparative merits of Tresavean and Dolcoath Mines, especially as there just now seems a desire for enquiry into the real state of mines as regards their future productiveness. The observer of conditions in a mining district, treasuring in his memory what has specially affected their results, will be less likely to come to hasty conclusions in drawing comparisons between mines, the conditions of which are identical. Justified by these facts I would offer a few remarks bearing on the comparative merits of Tresavean and Dolcoath. The both mines were very rich for copper, and the latter (Dolcoath) has proved a veteran of over a century's growth; but there is little doubt that operations were carried on upon an extensive scale subject to periods of neglect and depression for centuries, and no possible conjectures can be hazarded as to its aggregate yield and gains during that period, suffice it to say over a million sterling have been returned to the shareholders during the present century, to say nothing of previous nettings.

About 46 years ago it was considered to have failed for copper, the shares, 179 in number, fell to 8*l.*, 10*l.* each. On the recommendation of the late Capt. Charles Thomas, father of the present respected manager, that tin would be found in depth overcoming ancient prejudices it was determined to sink the mine and open levels below the great masses of copper, which proved his judgment correct. On leaving the clay-slate and entering the granite it be-

came rich for tin, and so rapidly progressed that in 1873 the market value was 390,000*l.*, and the profits for that year 45,645*l.* It is now selling at a market value of 330,000*l.*, and is most unquestionably the richest tin mine in Cornwall, or even the tin-producing districts of Australia or the known world.

The conditions being identical it is with more than ordinary interest I refer to the immediate future of Tresavean as a great tin-producing property. Like Dolcoath it was a copper mine of no ordinary merit, dividing profit from that mineral alone over 800,000*l.* between the proprietary: 30 years ago its further development (in depth) for copper was considered a failure, but its future as a great tin-producing mine was considered a certainty, as on the decline of copper its lower level left off rich in tin for a great length, and whoever drains the mine will find it under the same conditions as Dolcoath was found on being sunk below the old workings, and with a capital to mature operations directed by practical authorities no one can predict with certainty as to the expansion of yield and profits in the coming decade. Dolcoath shares sold at 8*l.* to 10*l.* each when in 179 shares; they are now 70*l.* each per 4700th share, or over 1800*l.* per original, and it is not too much to predict that those who place money in Tresavean will reap a corresponding benefit.—*St. Day, Scorrier, Oct.* 28. CHARLES BAWDEN.

DYNAMITE.

SIR,—In continuation of my letter in last week's Journal I forward for insertion an extract from the report of a meeting of the Cornish Mining Institute held in Cornwall last week. [The meeting is fully reported in another column.] The chief speaker (Mr. G. Smith) might have added that the price or dynamite (Nobel's) has been lowered from 200*l.* to 70*l.* per ton mainly through the competition of other makers; that the cost of guarding whose magazines would be as least as high as that which would fall on Nobel's Explosive Company—240,000*l.* per annum, and that the dynamite of these makers, who have mainly given so great a boon to miners in the reduction of price, is in every way as safe, as carefully nursed, as strong, and as well cared for as that which has been or will be made by Nobel's Explosives Company. J. T.

FOREIGN MINING AND METALLURGY.

The event of the last few days in the French Iron Trade has been the conclusion of a contract for rails by the Orleans Railway Company with the Steelworks Company of France at 5*l.* 5s. 2d. per ton, delivered free at Javisy. This is equivalent to about 4*l.* 16s. per ton at the works—a price which must appear incredibly low to all acquainted with the past history of steel rail production in France. The raw materials used in the manufacture of steel rails have certainly fallen during the last two years, but not to a proportionate extent. Merchants' iron has been affected by the general feebleness in affairs, and the latest quotation at Paris has been 5*l.* 16s. per ton. Pig has been in little request upon the German markets, but there has been a satisfactory current of orders for iron. The exports of rails from Germany in August were 12,843 tons, and in the first eight months of this year 90,412 tons. The exports of plates from Germany in August were 3263 tons, and in the first eight months of this year 30,761 tons. Some adjudications for axles and tyres which have just taken place have afforded a certain amount of employment to the German steelworks. At Erfurt the Osnabruck Works have taken an order for locomotive axles at 11*l.* 12s. per ton. An order for 10,000 tons of steel rails for Roumanian railways, has been secured in Germany; it has been shared between Bochum and the Phœnix Company.

The Belgian Iron Trade has shown scarcely any change. Prices have continued low, but Belgian ironmasters have found some compensation in the fact that raw materials have fallen in proportion. Under these circumstances the works, so long as they can obtain orders, are enabled to maintain their position fairly well. The great difficulty which presents itself, is, however, the obtaining orders; and the question is whether they will present themselves sufficiently freely to enable the works to hold their own as well as at present. The profits realised by the great Seraing Company in the first few months of its current financial year are stated to be superior to those acquired in the corresponding period of 1883; a larger business has been done in steel, and some important new orders have been received during the past month by the company's workshops and shipbuilding yards. These orders include a 100-ton pile hammer and 100-ton and 150-ton cranes for the Terni Steelworks (Italy). An order for a large despatch-boat has also come to hand at Hoboken. English pig has continued to be quoted upon the Belgian markets at 2*l.* 2s. to 2*l.* 3s. per ton. No. 1 Belgian iron has remained at 4*l.* 10s. per ton for export, and 4*l.* 10s. per ton for home account. No. 2 has been quoted at 4*l.* 16s. per ton, and No. 3 at 5*l.* 2s. per ton. Girders have been dealt in at 4*l.* 16s. to 5*l.* per ton; while No. 2 plates have been rather weak at 6*l.* 4s. per ton.

The Belgian Minister of Public Works has just adopted a decision which has been favourably received in Belgian industrial circles. In view of the increasing competition of English and German coal, as well in Belgium as upon foreign markets, Belgian colliery proprietors applied recently to the Minister of Public Works for new transport facilities and reductions of tariffs. The Minister has appointed a Commission to enquire into the whole subject The approach of winter has not yet brought with it the rise in prices upon which some Belgian colliery owners have been reckoning, and so long as cold weather does not seriously set in it appears probable that there will be no material or important change in the general state of affairs. All that can be said at present is that prices have remained firm all along the line. In the Couchant de Mons the state of affairs is regarded as satisfactory; stocks are small, and the winter is entered upon under favourable conditions. The number of trucks carrying coal and coke which passed over the Belgian State Railways in the week ending Oct. 19 was 19,995, as compared with 20,182 in the corresponding week of 1883. The German coal trade has sensibly revived with the approach of the winter, but at present coalowners have contented themselves with withdrawing all the concessions which they had made during the summer, and no actual advance has taken place in rates. Prices are at the same time maintained with more firmness than they were a month since.

EXCESSIVE BRAINWORK IN SCHOOLS.—It is a noteworthy fact that the question of how to properly counteract the generally depressing effects of excessive brainwork in schools is now being seriously considered abroad, and the measures there taken if satisfactory should commend themselves elsewhere. Official action with reference to overpressure has been taken in Prussia, Saxony, Wurtemburg, Baden, and Alsace-Lorraine. Experience in German schools, those of other countries as well, has shown and the same has undoubtedly been found in that physical exercise alone is not a sufficient antidote to brain pressure, and the remedy which was sought in a reduction in the number of hours of study, while not having completely solved the difficulty, has afforded considerable relief. A commission which was appointed in Alsace-Lorraine some time ago recommended that the number of study hours should be restricted to 26 a week for the lowest classes of the gymnasia, and to 28 and 32 for the higher classes; that the hours of home study should be 8, 12, and 18 a week, progressing from the lowest class to the highest; and, finally, that six hours a week should be devoted to general physical exercise. Similar provisions in the higher institutions of learning would be of the greatest benefit, and the constantly increasing demand for more time in which to assimilate the matter presented should not be left unheeded.

TITANIFEROUS IRON is abundant in New South Wales. It is found usually with alluvial gold, as at Ophir, Mudgee, and Wellington, in the county of Wellington; Bathurst; Bingera, county of Murchison; and Uralla, county of Sandon, in the diamond dritt. Large rolled masses occur at Uralla. Ilmenite, menaccanite, nigrine, and iserine are said to occur with gold, garnets, and chrysolites in the Five-mile Flat Creek, Cudgegong River, in the Lachlan, and at Talbragar, with magnetite; also near Wagga Wagga, county of Wynyard, and the Rocky River, county of Hardinge.

MINING AND METALLURGICAL PATENTS.

Supplied by Mr. ERNEST DE PASS, of Fleet-street, E.C., Fellow of the Institute of Patent Agents.

Amongst recent applications for patents, in which the readers of the *Mining Journal* are more immediately interested, are the following:—

J. Makin, Manchester, No. 14,071, Coating iron, steel, or other metal with lead.—W. Brownhill, London, No. 14,082, Rolls for rolling grooved or open-jointed iron and steel tubes.—T. Hampton, London, No. 14,085, Manufacture of steel and ingot iron.—J. Farthing and J. H. Lorrimer, London, No. 14,087, Manufacture of artificial asphalte.—H. W. Fenner, London, No. 14,091, Stills or boilers for distilling tar or other hydro-carbon substances.—J. Howarth, Manchester, No. 14,112, Apparatus for utilising running water for the production of motive power or pressure.—G. F. Horbury, Bombay, No. 14,124, Improvements in girders and beams.—S. Morgan, Birmingham, No. 14,128, Haulage clip for wire ropes and other ropes.—H. H. Doty, London, No. 14,129, Combined chair and fish or joint fastening for the rails of railways.—B. Broncs, London, No. 14,140 Manufacture of explosive compounds.—H. P. Tobey and G. B. Thayer, United States, No. 14,152, Process of and apparatus for concentrating ore.—W. Courtenay, United States, No. 14,158, Improvements in the manufacture of steel.—H. G. Fairburn, Cardiff, No. 14,198, Machinery for washing, separating, and purifying coal and other substances.—H. G. Fairburn, Cardiff, No. 14,199, Machinery for desiccating at low temperatures coal and other substances.—H. Fell, Surrey, No. 14,204, Getting gold from wheat by a new method.—H. C. Serjeant, United States, No. 14,210, Rock drills and supports therefor.

The following selected specifications have been recently published, and are now open to inspection and opposition:—

COUPLING RAILWAY AND OTHER VEHICLES.—E. Richmond, of Leicester, No. 498.—According to this invention the hook is fixed to one vehicle, and the link is so pivotted on another vehicle that when two or more vehicles are pressed together the link slides upwards over the hook, and falls into the coupled position by gravity.

SAFETY-VALVE.—A. Schmid, of Zurich, No. 1522.—The feature of novelty consists in providing a pivotted arm between the valve spring and the valve, so as to serve the valve and spring as a guide when the valve is lifted from its seat.

PROCESS AND APPARATUS FOR CASTING STEEL.—M. Brustlein, of Paris, No. 2786.—In this process a rotary ingot mould is fed from a ladle through a pipe of elbow form at bottom, so as to deliver the molten metal in a horizontal direction whilst the mould is rotating. The ladle is so arranged that it may have a rising motion to enable the point of delivery of the molten metal to be maintained at the surface of the bath.

MEANS FOR LOCKING RAILWAY SIGNALS AND POINTS.—S. C. C. Currie, of London, and J. A. Timmis, Westminster, No. 2991.—The locking operation is performed by bringing the working centres of a locking lever and connections into one straight horizontal line, the object being to dispense with catches.

SCOURING AND POLISHING BRASS AND OTHER METAL TUBES AND RODS.—T. Kendrick, Birmingham, No. 11,459.—An automatic reciprocating action is imparted to a band wound over the tube, and charged with the polishing medium.

PURIFYING WATER FOR USE IN STEAM BOILERS.—G. H. Nott, of Chicago, No. 11,661.—This invention consists in causing the water to be purified to flow under pressure through lime in a quiescent state, and then filtering the same.

STATISTICS OF THE LEAD TRADE, 1848 TO 1883 INCLUSIVE.

Year.	Average Prices. £ s. d.	English Lead. Tons.	Foreign Lead. Tons.	Lead Exported. Tons.	Consumed in England Tons.
1848	16 15 0	53,373	3,900	6,500	50,773
1849	15 19 0	58,715	7,500	17,300	48,915
1850	17 10 2	64,429	12,000	22,000	54,429
1851	17 3 6	65,289	14,500	19,300	60,489
1852	17 15 6	64,961	13,100	20,000	58,061
1853	23 8 0	60,969	17,800	16,300	62,469
1854	23 13 1	64,005	11,858	19,605	56,258
1855	23 3 0	65,691	7,246	22,247	50,690
1856	24 0 0	73,129	10,254	23,134	60,249
1857	23 16 10	69,266	12,768	22,088	59,956
1858	21 11 6	68,303	14,139	19,555	62,887
1859	22 6 0	62,382	23,620	20,571	65,431
1860	22 6 3	63,225	22,171	23,797	61,599
1861	21 9 0	65,644	23,109	19,295	69,458
1862	20 16 3	69,013	23,693	36,140	56,566
1863	20 16 0	68,221	28,604	36,052	60,773
1864	21 12 0	67,081	30,616	35,767	61,930
1865	20 2 0	67,221	34,903	27,278	74,296
1866	20 10 0	67,391	36,903	30,041	74,296
1867	19 11 0	68,441	45,158	29,119	84,480
1868	19 6 6	71,047	49,461	43,876	76,692
1869	19 1 6	73,259	52,688	48,365	77,577
1870	18 13 0	73,420	58,634	47,802	84,252
1871	18 4 0	69,037	64,908	44,489	89,456
1872	20 0 0	60,420	69,841	44,330	84,931
1873	23 6 0	54,235	62,563	32,010	84,788
1874	22 2 0	58,777	74,351	41 321	91,807
1875	22 9 4	57,435	89,705	38,624	108,516
1876	21 13 10	58,667	91,010	42,685	106,992
1877	20 11 3	61,403	105,472	47,885	118,990
1878	16 14 0	58,020	112 977	36,478	134,519
1879	14 16 6	51,635	117,014	40,530	128,119
1880	16 7 6	56,949	107,211	38,344	125,816
1881	14 19 3	48,587	106,593	48,453	106,727
1882	14 13 9	50,328	100,331	40,018	110,641
1883	12 14 6	39,190	118,521	42,848	114,863
An. ave. 36 years	19 14 5	62,282	49,309	31,782	79,689

MANCHESTER ASSOCIATION OF EMPLOYERS AND FOREMEN.—At the usual fortnightly meeting of the members of the above association, held on Saturday in the Technical School, Manchester, Mr. THOMAS ASHBURY, C.E., the President, in the chair. Mr. Alderman Bowes, of Salford, read an interesting paper "On M. de Lesseps and his Canals."—The Chairman, in opening the proceedings, remarked that canal engineering, which had long been neglected in this country, appeared recently to have sprung into considerable prominence, if they might judge by the numerous proposals which were now being put forward for the construction of canals in various parts of the kingdom.—Mr. Ald. Bowes having given a brief sketch of the life of M. de Lesseps gave a description of the construction of the Suez Canal, and the work now in progress on the Panama Canal. In the course of his paper he observed that the opposition of this country to the construction of the Suez Canal was now being repeated with regard to the Panama Canal, and he asked where was the capacity and the spirit of adventure which had characterised the engineers of this country in past years. It was a disgrace to England that she had shown such a spirit with regard to the Suez Canal, and that she had not sent out a Commissioner to report upon the Panama Canal. In the discussion which followed several members expressed the opinion that from a financial point of view England had shown a good deal of common sense in not supporting the Panama scheme, and that as a commercial scheme they would make a mistake if they did put any money in it.—Mr. Bowes replied that the trade of California and San Francisco would be a most important consideration in favour of the Canal. The usual vote of thanks, in proposing which Mr. Horsley expressed his regret that Mr. Bowes had taken so pessimist a view of English enterprise, then closed the proceedings.

THEORY OF MINE VENTILATORS.—In continuation of his memoir on the theories of centrifugal ventilators (les Théories des Ventilateur à force centrifuge) Mr. ALBERT GENDEBIEN, hon. M.E., has just issued (Namur: Ad. Wesmael-Charlier, rue de Fer) another pamphlet—Les Théories des Ventilateurs des Mines. The subject is dealt with in the same careful and exhaustive manner, and will be generally appreciated by those engaged in mine engineering.

ORE DRESSING IN EUROPE.

Although it is admitted that no amount of reading can form a satisfactory substitute for practice and practical experience, the study of the record of what has been done in the various districts in which an industry is carried on, and of the advantages and defects of the several processes used is almost of inestimable value to the student, because it enables him to avoid, when he actually goes to work at his profession, the loss of time which too often results from proposing and introducing arrangements which have already been tried and proved worthless, or, at least, inefficient. An excellent series of articles has been published in the Quarterly of the Columbia College School of Mines, comprising the European methods for the mechanical treatment of ores, and the articles having been carefully revised have now been issued in a really handsome little volume—The Practice of Ore Dressing in Europe. By WHEATON B. KUNHARDT, M.E. New York: John Wiley and Sons. London: Trübner and Co., Ludgate-hill—and thus placed within the reach of miners generally. The character of the book will be generally understood when it is stated it is, as it were, an enlargement of the very valuable series of papers on the same subject contributed to the *Mining Journal* a few years since by Mr. John Darlington. The general principles of ore dressing are first described, and there are then sections on underground separation, general size, classification, cleansing, spalling, rock breaking, sizing, handpicking, cobbing, roll crushing, jigging, rough hydraulic separation, comminution, hydraulic classification, slime washing, crushing and drying of concentrates, losses in wet dressing, special dressing operations, and features of mill construction.

The efficiency of iron as a structural material for batteries is, Mr. Kunhardt mentions, still regarded as a mooted question, and he states that in American practice five stamp battery frames built of channel iron, firmly and carefully braced, have rendered excellent service, particularly in districts difficult of access, or in prospecting work, but nothing heavier than 250 lbs., or, at most, 300 lbs. stamps are used. The attempt to employ heavier stamps has shown in a number of cases that the bolts and fastenings of iron frames are loosened by a great degree of vibration, and that the iron construction rapidly deteriorates. He explains the disadvantages of the Dingey pulveriser, and all machines of the same class. With regard to hydraulic classification, he observes that the classification produced in pits or deep runs is fairly regular; the shallower the run, however, or the thinner the stream of slime flowing over the deposited sediment, the closer does the separation approach that made on buddles, but it follows a well defined law, and generally becomes very irregular and unsatisfactory. Such shallow current classification is now rarely seen in practice. The labour incurred in handling the deposits of a large labyrinth, especially in the cold season, and the loss due to letting the settled material dry partially before it is mixed with water and washed, are very serious objections to the first mode of classifying and concentrating. The loss of float mineral from partial drying, familiar as this must be, seems frequently to be regarded with insufficient appreciation. Mr. Kunhardt, endeavouring on one occasion to make this source of loss very evident, treated some rich gold concentrates in a pan, and after collecting the fine native gold into a pure heading that was separated from the tailings of coarser pyrites and quartz, he exposed this gold to the air and then swept a sheet of water in gentle current over it. An exposure of a few moments on the pan had no effect in producing float mineral, but with a drying action of half a minute a very appreciable portion of the gold was carried over to the tailings as float: the operation on the headings was repeated quite a number of times, with the final result of washing away all the gold, which then continued to float indefinitely on the surface of the wash water. The adhesion of a thin envelope of air to each fine mineral particle, changing for the time its specific gravity, and the action of capillary repulsion observable upon close examination on the non-wetted surfaces of the mineral, are the productive causes of float mineral.

As much interest is just now felt in the economic treatment of auriferous mineral, one naturally turns to ascertain what Mr. Kunhardt says of the Frue vanner, and the conclusions which will be drawn from his operations are that, although it produces no middlings, and shows a lower percentage of gold saved than is claimed for some other apparatus, it gives satisfactory results in practice. He says that very fine head mineral will naturally settle at a lower point on the belt than coarser mineral of the same kind, compared with which it will require more time in reaching the head drum of the machine, and will be subjected for a longer period to the flow of slime and wash water, with all the greater chance of being carried over the lower drum by the current. On this account the vanner does not seem as favourable for the production of low grade tailings as the outward-flow round table on which the force of all the currents diminishes as these spread over an increasing area toward the lower part of the apparatus. The characteristic vanning motion of the machine, however, compensates more or less for its defect. It facilitates the flow of the slime, particularly that of the larger, easily rolling particles of gangue, while the fine mineral, when once deposited on the belt, adheres closely to it, and is but slightly affected by the lateral shaking motion. This mode of action will suggest at once why the vanner has found particular favour in the treatment of fine stamp meal and pulp—the mineral being nearly always reduced by stamping to a finer condition than the gangue. The favourable effect of vanning upon the flow of slime permits the use of very concentrated slimes and little wash water, and insures a capacity which is large compared with that obtainable on a plain travelling belt. One machine commonly treats 6 tons of fine stamp meal per day (not including the re-washing of tailings if such be necessary), though a capacity of 12 tons has been attained under highly favouring conditions. Two machines generally receive the slimes from a battery of five stamps.

The material which composes the volume has been collected at works where the several processes are in use, and each method referred to has been recorded and criticised with fairness and judgment, so that the book may safely be commended both to students and to mining engineers already practising as a really valuable work of reference.

AUTOMATIC RABBLING.—A furnace, the improvements of which relate more particularly to the means for stirring and discharging the ore, has been patented by the Matthieson and Hegeler Iron Company, of La Salle, Illinois. It is composed of a number of ovens, open at both ends, before which there is placed on each side a frame supporting a series of rods, which are adapted to be temporarily attached to rake-heads, and which are connected with mechanism for drawing them through the oven. Each rake is provided with one or more heads, made of a flat bar, bevelled from the top down to a sharp edge at the bottom in front. The heads are either square behind, or bevelled, so as to form a triangular bar, and are provided with a link for attaching them to the rods. A separate rake for each two ovens on the same level is employed.

OUTPUT OF COAL IN NEW SOUTH WALES.—The total output of the New South Wales collieries for 1883 exceeded 2,500,000 tons, the exact figures, 2,521,457 tons 1 cwt., being 412,175 tons in excess of the output for 1882. The average price per ton in 1883 being 9s. 6·40d., as against 8s. 11·97d. per ton in 1882. There has been considerable activity in the search for coal during the year, and there is reason to believe that several new collieries will be shortly opened up. A new coal company has been formed, and has started working a seam of coal between 4 and 5 miles from the Mittagong Railway Station; and one has been formed to work a coal seam about 3 miles from the Erith Colliery; the seam is said to be 7 or 8 ft. thick; and a seam of coal, 5 ft. thick, has been struck by boring about 1 mile south of the Erith Colliery. The Berrima Coal Company, while working the upper seam, is boring for another seam of coal some 60 or 70 ft. deeper. A seam of coal is reported to have been discovered at Bungawalbyn, about 25 miles from Lismore, but nothing has been done on it yet. A seam of coal, 2 ft. thick, containing 15 in. of good, bright, clean coal, was passed through at Grafton, at a depth of 183 ft., while boring for water. Coal of the best quality, and in very large quantities, is said to exist in the Coolah Valley.

PRACTICAL FIELD GEOLOGY—NIAGARA FOSSILS.

Under the able direction of Prof. J. W. Spencer, the geological department of the University of the State of Missouri is likely to increase in importance and usefulness, and do great service alike for the students and the scientific world generally. Large and commodious workshops are in course of erection, and additions by purchase and otherwise are being made to the zoological museum. But that which, perhaps, will be most beneficial to the scientific world generally is the determination of the officers of the museum of the University to publish the results of their investigations from time to time in the form of bulletins, the first of which have just been issued. The materials upon which the present number is founded were the result of several years' collecting by a few gentlemen, and the study of the confused mass of material thus accumulated has occupied Dr. Spencer's spare time for several years, resulting in the recognition of 50 new species of Niagara fossils. The number, which is accompanied with plates illustrative of the species described, including some which have never before been figured, is divided into three parts, and includes a monograph of 41 species of graptotilidæ (of which 30 are new); a monograph of stromatoporidæa; and 15 other new species. The subjoined abstracts of these papers will be interesting.

In the introduction to Part I. it is said the plant-like animal forms which have been included in the graptolite family have hitherto been considered as belonging essentially to the muddy deposits of the cambrian and cambro-silurian systems. However, a Canadian locality was discovered at Hamilton, Ontario, in the Niagara series about the year 1868 by Lieut.-Col. C. C. Grant. The earliest upper silurian graptolites made known were five species described by Prof. James Hall. Since that time six more species have been added by Dawson, Billings, Hall, and Whitfield. During 1878 Dr. Spencer described nine additional species in the Canadian Naturalist. In the present paper he now describes 21 new species, thus making a total of 41 described species of upper-silurian graptolites. As few fossils of the Niagara group can be said to be abundant so the graptolites are scarce yet the varieties are numerous. The beds in which they are principally found are those about 6 ft. above the base of the "chert-beds," and in the more shaly dolomites immediately underlying. In these last rocks the specimens are in a better state of preservation, especially at their earthy partings, though easily obliterated. The author says that in the detailed description he has given of the different species he had often been compelled to depend almost entirely upon the size of the stripes and the mode of branching, as the cellular structure had been obliterated in the majority of cases, even when the general form of the frond is perfectly distinct. This arises from the fact that the greatest varieties of species occur in the cherty dolomites, where, although the carbonaceous matter remains, the semi-crystallisation of the dolomitic earth has obliterated the internal structure. The literature of the study of the graptolites is widely diffused, both as to place and time, and although the author says that Prof. Hall's monographs of what is known are sufficient for the American student, he gives an account of those who have written on the subject, from the time of Linnæus to the present date. The geological distribution proves the great antiquity of this class of organisms. According to Prof. Hall's list, we find one species in the Potsdam; 53 species in the Quebec group (upper cambrian); four species in the Trenton; 30 species in the Utica and Hudson River group (cambro-silurian); two species in the corniferous; and two species in the Hamilton formations. There is great difficulty in recognising the true character of the graptolites. The majority of specimens is only represented on the stone by carbonaceous matter fragmentary and structureless. Even the corneous structure was often not unquestionably shown, though in the limestone it is often better preserved than in the shales. But the idea of their plant origin has long since been abandoned. That the Niagara forms are of animal origin is clearly shown, not only on account of the corneous substance seen in all the species, but on account of the apparent solid axis often seen, and the cellular structure sometimes seen, and it is now generally admitted that these organisms belong to some form of polpys. Concerning the structure of the graptolites, the author has followed the divisions proposed by Prof. Hall. First, the radical or initial point; second, the funicle or non-celluliferous connecting portions of the compound fronds, and the barren portions of the stripes; third, the central disc. In the parts of the stripe there is (1) the solid axis, (2) the common canal or cœnosarc, (3) the calycles or cellules, (4) nature and ornaments of tests. Some of the graptolites of the older formations are considered as not having been attached. This may possibly have been the case with some of the cyathiform species in the Niagara; but the evidence is that they were mostly attached by a common root. From the specimens which have been obtained in the Niagara formations it has been impossible to recognise the mode of reproduction. The author gives a synopsis of the genera of graptolitidæ, in which he follows the classification of Prof. Hall, and then describes in detail each species.

The second part is devoted to the description of 12 species of fossils of the family stromatoporidæ After the graptolites of the Niagara formation there are, perhaps, no more interesting fossils than these. Of this family six species are found at Hamilton, Ontario (four of which are new), and one new species at Dalhousie, New Brunswick, besides five species found in the upper silurian system. There has been much discussion as to the zoological affinities of these fossils, some placing them amongst the sponges, some the foraminifera, and some even the corals. The Niagara forms all consist of laminæ, which were originally calcareous deposited concentrically on some foreign surface separated by interspaces, through which delicate pillars extend connecting the lamellar surfaces. Those who consider these fossils as allied to sponges regard the laminæ and pillars as calcareous spicules cemented, and the larger tubes as oscula. A detailed description, as in Part I., is given of the various species: 15 other new fossils are described in the third part, several of them being both remarkable and interesting. Prof. Spencer may be congratulated upon the issue to the scientific world of this very interesting bulletin of the results of geological investigation in the State of Missouri, which augurs so well for future numbers.

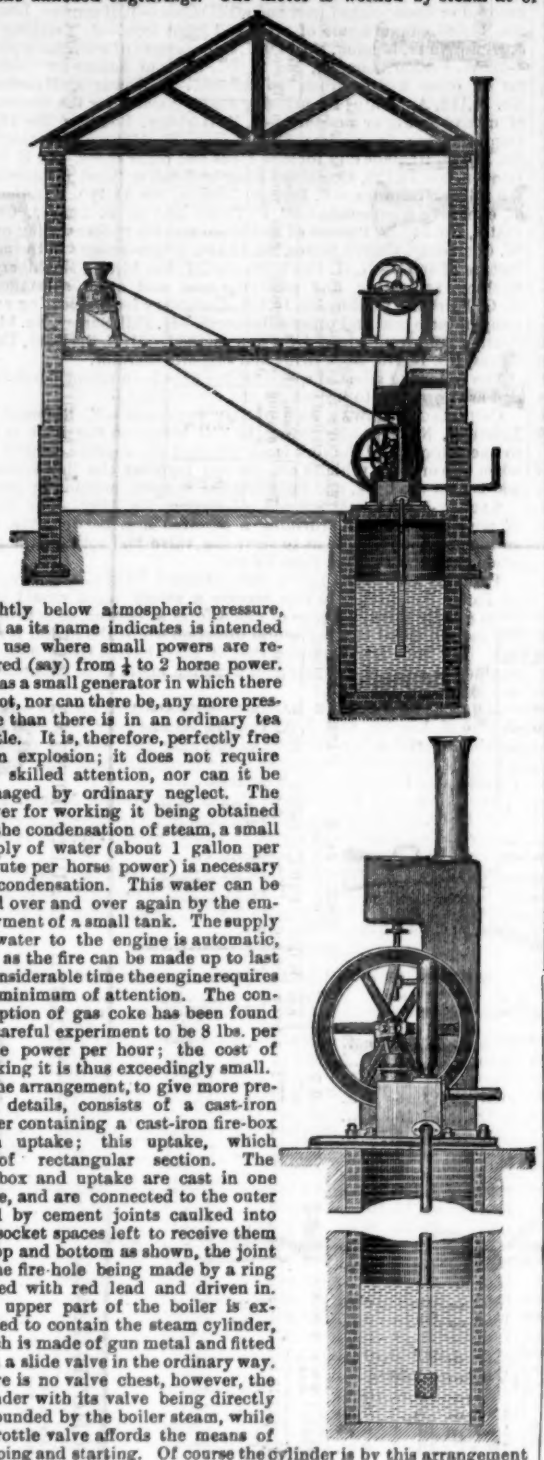
What New South Wales Is.—In one of the speeches delivered by Sir Henry Parkes, ex-Premier of New South Wales, before returning from London to Sydney, he said "the colony had a coast line of 700 miles. Its extent inland was about 900 miles, and its mean breadth was some 600 miles. It contained 195,882,150 acres of land. Of that land a very small proportion had passed into private ownership; by far the greater portion—he should think about 19-20ths—was still in the hands of the Crown, waiting for owners. The country was sufficiently extensive to embrace in one part or other of it nearly every variety of soil and nearly every variety of climate. If he were to speak of the general climate, he might very justly liken it to the climate of Southern Europe; but in so large a territory there were, of course, extreme variations. The varieties of soil and climate were such that in one place or other they could produce almost any vegetable or floral growth. The country teemed with mineral wealth; they had some of the richest beds of coal to be found in any part of the world. Thus, in Newcastle they carried on colliery operations as successfully as in any part of England. From 50 or 60 miles to the north of Sydney, and as many miles to the south of it, they had other collieries opened, which were also flourishing and producing coal suitable for every purpose, and specially suitable for steam navigation. They had rich beds of iron, rich copper mines, and inexhaustible mines of gold and silver. They had large numbers of gem stones, marbles, and rich building stones. As to the climate, he believed that the statistics showed as good results as any other country. He found that in the year 1881 the births were 38 per cent. on the mean population, while the deaths were only 15 per cent."

Journalism and Life Assurance.—The *Gaulois* undertakes to pay a sum of 5000 fr. at the decease of any subscriber who may meet with his death on a railway or tramway, or by being run over by a vehicle in the street. A proportionate sum is paid for injuries received. All that is necessary to produce is the last receipt of subscription. The *Gaulois* also pays compensation to any purchaser of a single copy, or his heirs, should he be injured or killed on the day on which the paper is bought.

THE DOMESTIC MOTOR.

(DAVEY'S PATENT).

A want has long been felt for a simple and safe motor for small powers, requiring little attention, and not liable to get out of order. This want has now been supplied by the Domestic Motor represented in the annexed engravings. The motor is worked by steam at or



slightly below atmospheric pressure, and as its name indicates is intended for use where small powers are required (say) from ¼ to 2 horse power. It has a small generator in which there is not, nor can there be, any more pressure than there is in an ordinary tea kettle. It is, therefore, perfectly free from explosion; it does not require any skilled attention, nor can it be damaged by ordinary neglect. The power for working it being obtained by the condensation of steam, a small supply of water (about 1 gallon per minute per horse power) is necessary for condensation. This water can be used over and over again by the employment of a small tank. The supply of water to the engine is automatic, and as the fire can be made up to last a considerable time the engine requires the minimum of attention. The consumption of gas coke has been found by careful experiment to be 8 lbs. per horse power per hour; the cost of working it is thus exceedingly small.

The arrangement, to give more precise details, consists of a cast-iron boiler containing a cast-iron fire-box with uptake; this uptake, which is of rectangular section. The fire-box and uptake are cast in one piece, and are connected to the outer shell by cement joints caulked into the socket spaces left to receive them at top and bottom as shown, the joint at the fire-hole being made by a ring coated with red lead and driven in. The upper part of the boiler is extended to contain the steam cylinder, which is made of gun metal and fitted with a slide valve in the ordinary way. There is no valve chest, however, the cylinder with its valve being directly surrounded by the boiler steam, while a throttle valve affords the means of stopping and starting. Of course the cylinder is by this arrangement most effectively steam jacketted. The piston is coupled by a connecting rod in the usual way to a crank-shaft supported by bearings which are mounted on brackets cast in one with the boiler, as shown. The crank-shaft is provided with an eccentric for actuating the slide valve in the usual way, while at one end it carries a fly-wheel, and at the other a disc crank for driving the air-pump. When the engine is used for pumping purposes the pump is mounted on the bed-plate and driven from a crank-pin in the fly-wheel, cast with the boiler in a pocket forming the condenser. Air-pump is single-acting, and is fitted with a plunger, not having any packing. When near the bottom of its stroke, however, it uncovers a small hole which allows water from the hot well to flow back into the plunger and over its edges, thus forming a water seal. At the high speed at which these engines are run a plunger wholly submerged would splash the water about too much, but the contrivance just described avoids this trouble, and serves the same purpose of making a water joint. The boiler is fed from a closed feed chamber which is cast on the side of the condenser above the hot well. This chamber is in free communication with the boiler by two passages—a large one leading into the steam space, and a small one leading to the boiler below the water line. The water thus stands in the feed-chamber at the same level as in the boiler. The feed-water is brought to the feed-chamber by a flexible pipe attached to a cock which has a nozzle projecting into the feed-chamber, the nozzle being fitted with a plug and float. If the water levels falls the float, of course, falls with it, thus lowering the plug and admitting more water to the boiler until the proper level is restored. The boiler is provided with a loose cover or large valve at the top, and when starting the engine steam is got up until it blows through this valve, and expels the air from the boiler. The engine being then turned round and the condenser blown through a partial vacuum is formed, and the engine works just like an ordinary condensing engine. In practice the engine does best if the steam is kept just below blowing-off point, or practically at atmospheric pressure, as there is then no tendency for air to leak in at the stuffing-boxes of the piston-rod and valve spindle, even if these are but slackly packed. The engine will, however, work perfectly well with several inches of vacuum in the boiler, the amount of vacuum permissible, of course, depending upon the load. In the condenser the vacuum obtained is 25 in. to 26 in., and an experiment was made to show the degree of vacuum required to overcome the friction of the engine and resistance of the air-pump, this experiment showing that with a vacuum in the condenser, only 5 in. of mercury lower than the pressure in the boiler, the engine ran at its normal speed. As under ordinary working conditions the difference between the boiler and condenser pressures is about 25 in. of mercury, there is a margin of 20 in. of mercury, or (say) 10 lbs. per square inch above that required to overcome the friction of the engine available for producing motive power. This gives an efficiency of 80 per cent., which, it must be acknowledged, is a splendid result, and is two to three times better than that of hot-air engines. Working as it does at atmospheric pressure, Mr. Davey's engine is, of course, absolutely safe, while, as the boiler is self-feeding and the fire can be made up to last a considerable time, the engine requires the minimum of attention. Altogether Mr. Davey has succeeded in producing a very useful and interesting type of motor, and one for which we anticipate there will be a very extensive demand. We may add that in the engines shown at Shrewsbury all the bright work is nickel plated, and the workmanship is excellent.

Messrs. Hathorn, Davey, and Co. are constructing one of these useful motors to indicate from 3 to 4-horse power for the purpose of lighting a small country house by electricity by means of glow lamps. They find that with a good dynamo nine glow lamps can be driven per indicated horse power per hour. Numbers of these motors have been supplied for driving chaff cutters, milk and cream separators, and for pumping water for the use of country houses, farms, &c. Owing to the extreme simplicity of these engines, and the fact that there is no trouble with pressure gauges or other delicate fittings, and that there is no difficult packing required, nor special lubricant of any kind, and that any unskilled labourer can work them without any danger of explosion, there appears to be a very large field for them in the future. The cost of coke for working the Domestic Motor is about ¼d. per horse power per hour, and a motor of 1-horse power gives out three times the effective work of a 1-horse power hot-air engine, besides possessing the very great recommendation that the generator is not liable to be burnt out as it is in the air-engine. Comparing its efficiency with the gas-engine the cost of coke is about one-fourth that of gas, and the cylinder requires no oiling whatever. Where the motor is employed for driving dairy machinery it also affords the supply of hot water required for the dairy. It may also be used for circulating hot water for heating the building in which it is used.

TOPOGRAPHY OF MACHINES.

At the American Association for the Advancement of Science, held at Philadelphia in September last, a paper was read by Mr. Oberlin Smith, the object of which was to briefly call attention to the loose system, or rather entire lack of system, prevailing in our drafting-rooms and machine shops, in writing and speaking of the relative locations of the various parts of the machinery. An instance of the confusion caused in the minds of workmen who have to receive orders from their superiors when constructing an instrument is where some point on a drawing is spoken of as to the right or left of some other given point or line, because it appears so upon a side view, while, in the machine itself, it is really backward or forward of the given point or line. Another instance is where some member of a machine is supposed to have considerable individuality of its own, and has some important side, which its christener chooses to call its front, facing in a different direction from the main front of the machine itself.

The remedy the author has found in the following positive rules:—1. Every machine must have some one side assumed as its front, and another side at right angles to this and the one that is usually beneath, assumed as its bottom. Opposite to these respectively are, of course, the back and top, while the right and left are at the right and left of a person standing in front of the machine and facing toward it.—2. In the case of travelling machines, such as boats, locomotives, reapers, and other vehicles, the end that goes forward must, of course, be called the front. As the operator is upon such a machine (instead of outside of it), and with his face forward, the right and left sides are reversed in relation to the front and back.—3. In stating the location of any part in relation to some other part, or to a main centre line or reference plane, the only terms to be used are these six—"Front of," "back of," "right of," "left of," "above," "below."

The author has found the use of these rules of great advantage in explaining new work to his assistants and had recently been able to have them hurry to completion an intricate machine the design of which he was obliged to leave unfinished when starting away on a prolonged absence. To carry out the matter to an ideal state of perfection would involve a reform in mechanical nomenclature and the coining af a number of new words, together with the establishment of a system by which any part of a machine could be definitely located and its entire construction described in a table of words and figures, without the use of any drawings at all. Such a topographical scheme the author briefly outlined, but said he had not yet worked it out to the stage that fits it for the workshop. The author says that no new principles are here claimed, but merely the application of some very old ones; it is in fact only the common-sense use of methods which have long been employed by the geographer, the topographical engineer, and even by the landscape gardener and the railway contractor.

Concave-Surfaced Piston.—A patent has been taken out by Mr. G. Dieckmann, of New York, for a new steam-piston, the opposite faces of which are not, as usual, flat, but curved inwardly, thus presenting two concave surfaces to the action of the steam. The edges of the concave surfaces which are in contact with the cylinder walls are made tapering, diminishing in thickness towards the ends of the piston. The steam when admitted will, besides moving the piston up and down, bear laterally against the tapering edges of the piston, and thus drive them against the cylinder walls. In this way the piston, it is claimed, is always properly tightened without the use of any additional packing.

HOLLOWAY'S PILLS AND OINTMENT—RHEUMATISM AND GOUT.—These purifying and soothing remedies deserve the earnest attention of all persons liable to gout, sciatica, or other painful affections of the muscles, nerves, or joints. The ointment should be applied after the affected parts have been patiently fomented with warm water, when it should be diligently rubbed upon the adjacent skin, unless the friction causes pain. Holloway's pills should be simultaneously taken to diminish pain, reduce inflammation, and purify the blood. This treatment abates the violence, and lessens the frequency of gout, rheumatism, and all spasmodic diseases which spring from hereditary predisposition, or from any accidental weakness of constitution. The ointment checks the local malady, while the pills restore vital power.

BRITISH AND FOREIGN SAFETY FUSE COMPANY,

WORKS: REDRUTH, CORNWALL,

MANUFACTURERS OF

PATENT SAFETY FUSE FOR ALL KINDS OF BLASTING PURPOSES,

For MINING & RAILWAY OPERATIONS,

ALSO FOR

ALL KINDS OF SUBMARINE WORK.

This FUSE is made for ALL CLIMATES, and of any length and sufficient water-resisting properties to ensure ignition at any depth.

For PRICE LISTS, SAMPLES, &c., apply at the Works, or

LONDON OFFICES—3 and 4, Adelaide Place, King William Street, London Bridge, E.C.

TRADE MARK,—TRICOLOUR COTTON (Red, White, and Blue), running through the coil of Powder.

TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM.

LONDON: 35, Queen Victoria Street. NEWCASTLE: St. Nicholas Buildings. MANCHESTER: Deansgate. GLASGOW: Argyle and Hope Streets.

(No. 16.)

TANGYES' SCREW LIFTING JACKS.

"A" Bottle Traversing Jack.

BOTTLE TRAVERSING JACK "A."
Wrought-Iron case.

Tons.	Diam. Elevating Screw.	Height when down.	Length Traverse.	PRICE.
8	2¼ in.	20 in.	6½ in.	£3 2 0
10	2⅜ ,,	24 ,,	9 ,,	3 12 0
12	2⅜ ,,	24 ,,	12 ,,	3 18 0
15	2½ ,,	26 ,,	12 ,,	4 7 0
18	2¾ ,,	27 ,,	16 ,,	6 0 0
20	3 ,,	27 ,,	22 ,,	6 19 0

Top Nut if of Brass, extra.

"A A" Leg Traversing Block.

LEG TRAVERSING JACK "A A."
Top and Bottom Nuts of Brass.

Tons.	Diam. Elevating Screw.	Height when down.	Length Traverse.	PRICE.
8	2¼ in.	20 in.	6½ in.	£3 6 0
10	2⅜ ,,	24 ,,	9 ,,	4 0 0
12	2⅜ ,,	24 ,,	12 ,,	4 6 0
15	2½ ,,	26 ,,	12 ,,	4 18 0
18	2¾ ,,	27 ,,	16 ,,	6 16 0
20	3 ,,	27 ,,	22 ,,	8 4 0

"A A A" Steel Case Traversing Jack.

STEEL CASE TRAVERSING JACK "A A A."
New Design—Registered.

Tons.	Diam. Elevating Screw.	Height when down.	Length Traverse.	PRICE.
8	2¼ in.	20 in.	6½ in.	£2 18 0
10	2⅜ ,,	24 ,,	9 ,,	3 5 0
12	2⅜ ,,	24 ,,	12 ,,	3 10 0
15	2½ ,,	26 ,,	12 ,,	3 15 0
18	2¾ ,,	27 ,,	16 ,,	5 10 0
20	3 ,,	27 ,,	22 ,,	6 10 0

N.B.—This Jack may be had with Brass Case, instead of Steel, at an extra price.

132.

TANGYES' SCREW LIFTING JACKS.

"B" WOOD HALEY JACK.
The Worms and Wheels are of hammered iron, case hardened.

Wood Case.

Tons.	Diam. Screw.	Height when down.	PRICE.
2	1¾ in.	28 in.	£2 6
4	2 ,,	30 ,,	2 17
6	2¼ ,,	31 ,,	3 5
8	2½ ,,	33 ,,	4 0
10	2¾ ,,	33 ,,	4 8
12	3 ,,	35 ,,	5 12
16	3½ ,,	38 ,,	8 12
20	4 ,,	41 ,,	11 0

"Ba" IRON HALEY JACK.
The Worms and Wheels are of hammered iron, case hardened.

Steel Case.

Tons.	Diam. Screw.	Height when down.	PRICE.
2	1¾ in.	25 in.	£2 15
4	2 ,,	28 ,,	3 6
6	2¼ ,,	28 ,,	3 17
8	2½ ,,	20 ,,	4 13
10	2¾ ,,	31 ,,	5 5
12	3 ,,	33 ,,	6 15
16	3½ ,,	35 ,,	9 15
20	4 ,,	38 ,,	12 5

WINDLASS JACKS.

Steel Case.

"C" SINGLE PURCHASE.

Tons.	Diam. Screw.	Height when down.	PRICE.
5	2 in.	30 in.	£3 5
8	2½ ,,	31 ,,	3 9
10	2¼ ,,	32 ,,	3 10

"D" DOUBLE PURCHASE.

Steel Case

Tons.	Diam. Screw.	Height when down.	PRICE
8	2¼ in.	31 in.	£4 19
10	2½ ,,	32 ,,	5 13
12	2¾ ,,	34 ,,	6 12

"F" TRIPOD WINDLASS JACK.

Steel Case.

Tons.	Diam. Screw.	Height when down.	PRICE.
5	2 in.	32 in.	£3 0
8	2½ ,,	33 ,,	3 7
10	2¾ ,,	33 ,,	3 10

"G" RATCHET BOTTLE JACK.

Steel Case.

Tons.	Diam. Screw.	Height when down.	PRICE.
5	2 in.	17 in.	£0 19 6
6	2½ ,,	20 ,,	1 1 0
8	2¾ ,,	23 ,,	1 16 0
10	2⅜ ,,	26 ,,	2 2 0
12	2½ ,,	30 ,,	2 9 0
15	2¾ ,,	33 ,,	2 18 0

133.

TANGYES' SCREW LIFTING JACKS.

H

TRIPOD JACK. Brass Nut.

Ha

TRIPOD-BOTTLE JACK. Steel Case.

I

BOTTLE JACK. Steel Case. (14 to 20 Ton have

New Design registered, combining advantages of both Tripod & Bottle Jack, wrought-iron cases)

Tons.	Diam. Screw	Height down.	PRICE H	PRICE Ha	PRICE I	Tons.
	in.	in.	£ s. d.	£ s. d.	£ s. d.	
2	1½	9	0 12 9	0 8 0	0 8 0	2
3	1¾	12	0 14 6	0 9 6	0 9 6	3
4	1⅞	15	0 19 6	0 13 0	0 13 0	4
5	2	18	1 4 0	0 15 0	0 15 0	5
6	2½	21	1 9 0	0 19 6	0 19 6	6
8	2⅝	24	1 14 6	1 2 6	1 2 6	8
10	2⅜	27	2 4 0	1 9 6	1 9 6	10
12	2½	30	2 11 0	1 14 0	1 14 0	12
14	2¾	33	3 0 0	—	2 15 0	14
16	3	36	3 10 0	—	3 6 0	16
18	3¼	42	5 0 0	—	6 0 0	18
20	3½	48	6 0 0	—	7 0 0	20

K

CAPE WAGON JACK. Cast-Iron Case.

Ka

BOTTLE JACK. Cast-Iron Case.

L

CAPE WAGON JACK. Wood Case.

Tons.	Diam. Screw.	Height down.	PRICE K	PRICE Ka	PRICE L	Tons.
	in.	in.	£ s. d.	£ s. d.	£ s. d.	
1½	1½	12	0 8 0	0 6 0	0 11 0	1½
2	1½	15	0 9 3	0 7 0	0 12 0	2
4	1¾	18	0 11 9	0 9 3	0 15 0	4
5	1¾	21	0 12 9	0 10 6	0 15 6	5
6	1⅞	24	0 16 0	0 13 9	0 18 9	6
8	2⅛	24	0 19 0	0 16 3	1 1 6	8
10	2⅜	24	1 2 0	0 19 3	1 3 6	10

TANGYES' SCREW LIFTING JACKS.

TRAM-CAR TRAVERSING JACK. Steel Case. To lift at head and foot.

RACK AND PINION JACK. Steel Case. The Pinions and Wheels are of Hammered Iron, case hardened.

Tons.	Diam. Elevating Screw.	Height when down.	Length Traverse.	PRICE.
	in.	in.	in.	£ s. d.
6	2	15½	6½	3 13 0
12	2¼	13	9	4 6 0

Height of Foot from ground in 6-ton size is 3½ in.; in 12-ton size, 4 in.

Purchase.	Tons	Height when down.	PRICE
		in.	£ s. d.
Single	3	30	3 9 0
Single	4	30	4 0 0
Double	6	32	6 3 0
Double	10	32	7 4 0

SHEWARD'S TELESCOPE TRAVERSING JACK. Cast-Iron Case—Steel Nut.

BALL'S TELESCOPE JACKS. Cast-iron Case—Steel Nut.

Tons.	Diam. Elevating Screw.	Height when down.	PRICE
	in.	in.	£ s. d.
10	2½	16	7 10 0
15	2¾	18	10 0 0
20	3	20	12 0 0

Tons.	Diam. Small Screw	Height when down.	PRICE Telescope Jack.	PRICE. Ratchet Tel. Jack.
	in.	in.	£ s. d.	£ s. d.
3	1⅜	11	1 8 0	1 17 0
4	1½	12½	1 13 0	2 5 0
5	1½	15½	1 17 6	2 8 0
6	1¾	20	2 7 0	2 15 0

135

TANGYES' HYDRAULIC LIFTING JACK

Adopted by the British and many Foreign Governments, and most of the principal Railway Companies and Engineers in the World.

LIFTING JACK.

TRAVERSING JACK.

This Jack is arranged so that one man can raise the specified weight.

Tested to	Height when down.	Run out.	Weight.	Price Lifting.	Price Traversing.
3 tons.	19 inches.	6 inches.	34 lbs.	£3 0	£6 0
4 ,,	23 ,,	10 ,,	57 ,,	4 0	7 0
6 ,,	24 ,,	10 ,,	68 ,,	4 10	8 0
8 ,,	26 ,,	11 ,,	76 ,,	5 10	9 0
10 ,,	27 ,,	12 ,,	85 ,,	6 0	9 10
12 ,,	27 ,,	12 ,,	98 ,,	6 10	10 0
15 ,,	28 ,,	12 ,,	104 ,,	7 0	11 0
20 ,,	28 ,,	12 ,,	132 ,,	8 0	12 0
30 ,,	29 ,,	12 ,,	174 ,,	10 0	16 0
40 ,,	29 ,,	11 ,,	206 ,,	12 0	19 0
50 ,,	29 ,,	11 ,,	284 ,,	14 0	25 0
60 ,,	29 ,,	10 ,,	304 ,,	16 0	27 0

TANGYES' HYDRAULIC SHIP JACK.

Tested to	Height when down.	Run out.	Cast Steel or Wrought Iron Cylinders.
20 tons.	12 inches.	6 inches.	£9 0
35 ,,	14 ,,	7 ,,	12 0
50 ,,	14 ,,	7 ,,	15 0
70 ,,	14 ,,	7 ,,	17 0
100 ,,	14 ,,	7 ,,	19 0
150 ,,	14 ,,	7 ,,	23 0
200 ,,	14 ,,	7 ,,	28 0

If with Safety Valve attached, 4£ extra.

138.

TANGYES' HYDRAULIC LOCOMOTIVE JACK.

In this Jack the cylinder and cistern are in one. The weights named can readily be raised by one man.

Tested to	Height when down.	Run out.	Traverse.	Price.
12 tons	20 in.	12 in.	12 in.	£9 0
15 ,,	20 ,,	10 ,,	16 ,,	12 0
20 ,,	20 ,,	10 ,,	22 ,,	13 1

TANGYES' HYDRAULIC CARRIAGE LIFTER.

This Lifter is designed for raising the end of a Railway Carriage or Wagon to facilitate examination of axles, &c. The carriage can be raised about 2 feet in less than one minute by one man.

Tested to ... ... tons	2	4	6	8	10	12
Height when down, in.	29	29	29	29	29	29
Run out ... ... ,,	20	20	20	20	20	20
Weight ... ... lbs	84	90	100	112	146	160
Price ... ... £	6	7	8	9	12	15

139

TANGYES'

AMERICAN HYDRAULIC LIFTING JACK.

LIFTING JACK.

TRAVERSING JACK.

In lifting, it may happen that another stroke cannot be made, in which case the lever should be gently raised a little and pushed slowly down; by this means a stroke will be missed.

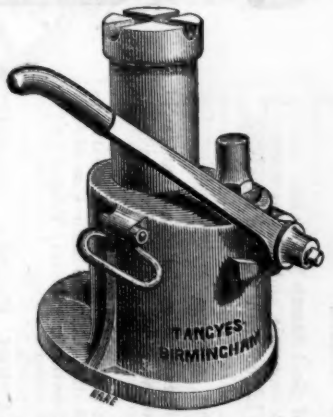
To lower—withdraw the lever from the shaft to miss the lug, and press it gently down.

Tested to	Run out.	Price Lifting.	Price Traversing.
7 tons	12 in.	£10	£13
10 ,,	12 ,,	12	15
15 ,,	12 ,,	15	18
20 ,,	12 ,,	18	21
30 ,,	12 ,,	21	26
45 ,,	12 ,,	25	32
60 ,,	12 ,,	30	37

140

TANGYES'

AMERICAN HYDRAULIC LOCO JACK.



In lifting, it may happen that another stroke cannot be made, in which case the lever should be gently raised a little and pushed slowly down; by this means a stroke will be missed.

To lower—withdraw the lever from the shaft to miss the lug, and press it gently down.

Tested to	Ordinary Run out.	Price.	Telescopic Run out.	Price
10 tons.	9 in.	£15	18 in.	£20
15 ,,	9 ,,	17	18 ,,	24
20 ,,	12 ,,	20	24 ,,	28

141

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MINING MACHINERY,
MILLING MACHINERY

Of the MOST APPROVED AMERICAN PATTERNS.

GOLD MILLS.

The California pattern of Gold Stamp Mill is universally accepted as the most perfect, economic, and efficient made.

We have over 900 stamps in successful work in the various Western Gold Districts.

SILVER MILLS.

Silver amalgamation in Pans is essentially an American system evolved after years of work on the rich silver mines Nevada.

We have over 500 Stamps, with necessary pans, settlers, roasting furnaces, &c., all of our own manufacture, at work in different silver camps of the United States, Mexico, and South America, and Phillipine Islands, Asia.

CONCENTRATION MILLS

Of the most approved German pattern and arrangement, or with Stamps and Frue Vanner Concentrators for low grade silver ores, light in lead. We have over 20 large German pattern mills at work on lead, zinc, or copper ores, and numerous Vanner mills on ores never before successfully concentrated.

Mining Pumps, Cornish pattern, of the largest sizes. **Hoisting Engines,** from 4 h.p. up to the largest direct-acting engines to sink 3000 feet.

SMELTING WORKS.

We have 80 Water Jacket Smelting Furnaces in use from 20 in. circular up to 54 in. by 60 in. for lead and silver smelting; and special High Jacket Furnaces for copper ores.

Engines of any size, plain slide valve, Corliss, compound Corliss, Boilers, all sizes. **Leaching Mills, Hallidie Wire Rope Tramways. Comet Crusher,** with capacity of 12 to 20 tons per hour. **White, Howell. Bruckner, and Stetefeldt Roasting Furnaces, &c.**

We have had twenty years experience in the manufacture solely of MINING MACHINERY, and have special facilities for shipping to all foreign parts through our New York Office, where all details of clearance, shipment, and insurance are conducted. Our machinery is already well known in Mexico, Peru, Chili, Venezuela, Honduras, and other South American countries.

Correspondence solicited. Descriptive Circulars and Catalogues on application

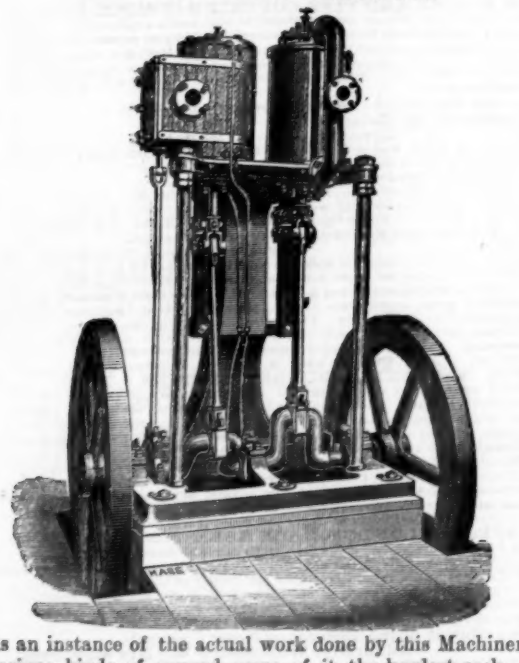
FRASER AND CHALMERS.

PRINCIPAL OFFICE AND WORKS.	NEW YORK OFFICE.
Fulton and Union Streets Chicago, Ill, U.S.	No. 2, Wall Street, New York, U.S.

COLORADO OFFICE—CHEESMAN BLOCK, DENVER.

THE

"Champion" Rock-borer
AND AIR COMPRESSOR.



As an instance of the actual work done by this Machinery in various kinds of ground, some of it the hardest rock, it may be mentioned that in Cornwall, irrespective of the work performed by the "Champion" Rock-borers and Air-compressors purchased by various Mines, the drivage, rising, sinking, and stoping done by contract by the Proprietor with his own Machinery now amounts to over 1350 fathoms.

Several of these Air-compressors, ranging from 3½ to 12 tons in weight may be seen in constant work in the Camborne Mining District.

R. H. HARRIS,
ENGINEER,
63, QUEEN VICTORIA STREET, LONDON.

KIRKSTALL, BOWLING, AND STAFFORDSHIRE BAR IRON

RAILS — RAILS — RAILS —

New, slightly defective.

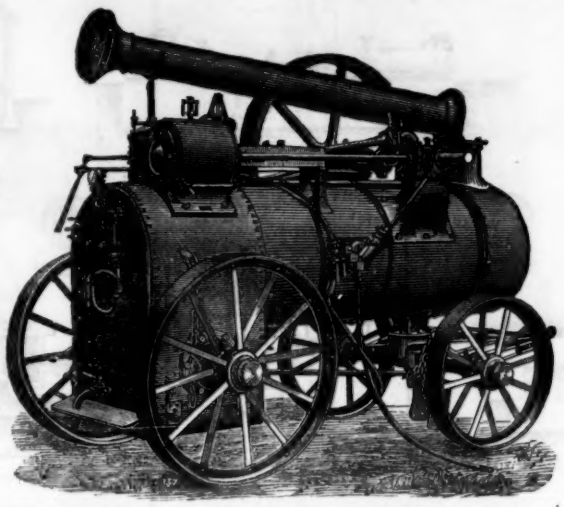
F.B. SECTION—BULL HEAD—DOUBLE HEAD—
10, 12, 14, 16, 18, 20, 24, 30, 40, 50, 60, 70, 75, 80 lb. per yard.
Sections on application to

WILLIAM FIRTH, WATER LANE, LEEDS.

POINT and CROSSINGS with all Fittings complete.
2000 tons in stock ready for delivery.

CLAYTON AND SHUTTLEWORTH,
STAMP END WORKS, LINCOLN, AND 78, LOMBARD STREET, LONDON.

☞ *The Royal Agricultural Society of England have awarded Every First Prize to CLAYTON and SHUTTLEWORTH for Portable and other Steam Engines since 1863, and Prizes at every Meeting at which they have competed since 1849.*



Steam Engines, portable & fixed,
For Coals, Wood, Straw, and every kind of Fuel.
OVER 21,500 SOLD.

Thrashing Machines.
OVER 19,500 SOLD.

Straw, Corn, and Hay Elevators.
Chaff Cutters for Steam Power.
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EDGE TOOLS, HAMMERS, PICKS, AND ALL KINDS OF TOOLS FOR RAILWAYS, COLLIERIES, ENGINEERS, AND CONTRACTORS LOCOMOTIVE ENGINE, RAILWAY CARRIAGE, AND WAGON SPRINGS AND BUFFERS.

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POTENTITE.

This unrivalled Explosive, as manufactured by the **New and Perfected Machinery** of the Company, is perfectly safe for transit, storage, and use, and is employed in every description of Mining or Quarrying Work, for Tunnelling, Pit Sinking, Engineering Work, and Submarine Operations, with the most complete success and satisfaction.

Potentite does NOT contain its own MEANS OF IGNITION, is free from Nitro-Glycerine, and its SAFETY has been speciall demonstrated by public experiments.

Its strength is unequalled. Its action is certain.

In action it gives off neither flame, smoke, nor offensive smell. By its use labour is economised, as work can be resumed immediately after the shot is fired.

POTENTITE is specially adapted for export to hot climates, as it is unaffected by heat, and is free from dangerous exudations.

POTENTITE IS THE SAFEST STRONGEST, AND WORK FOR WORK, CHEAPEST EXPLOSIVE IN THE MARKET.

For particulars and prices, apply to—

THE POTENTITE COMPANY, LIMITED.

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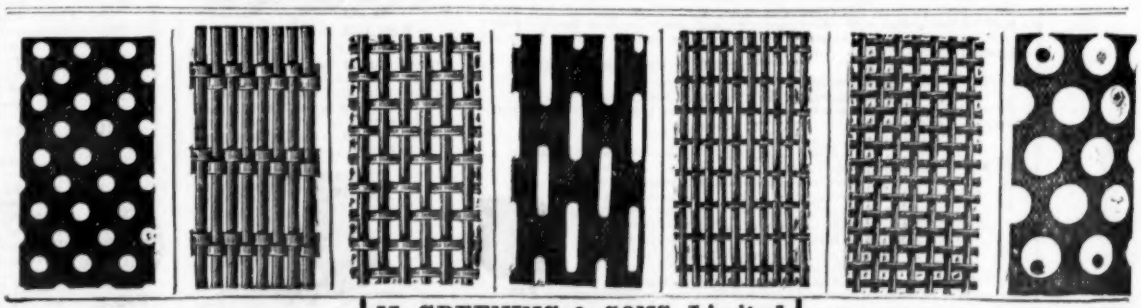

Extra Treble Strong Wire Cloth and Perforated Metals in Steel, Iron, Copper, Brass, Zinc, Bronze.

Made in all Meshes and Widths.

N. GREENING & SONS, Limited,
Wire Manufacturers and Metal Perforators,
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Jigger Bottoms, Trommels, Cylinder Covers, Riddles, Sieves for Diamond, Gold, Silver, Copper, Lead and Tin Mines.

Samples and Prices free on application.

FRANCIS MORTON AND CO., LIMITED, LIVERPOOL,

MANUFACTURERS OF

GALVANISED CORRUGATED IRON ROOFS, BUILDINGS, AND SHEDDING,

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Forges, Rolling Mills, Puddling Sheds, Ironworks, and Collieries

Erected Complete in this Country, or prepared to Plan for Erection Abroad.

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GALVANISED OR PAINTED CORRUGATED IRON ROOFING PLATES and TILES. HEAVY CORRUGATED IRON PLATES for fireproof floors, roadways, parapets, &c. (for producing which F. M and Co. have recently laid down powerful Hydraulic Machinery). Wrought-iron Tanks, Guttering, and General Constructional Wrought Ironwork.

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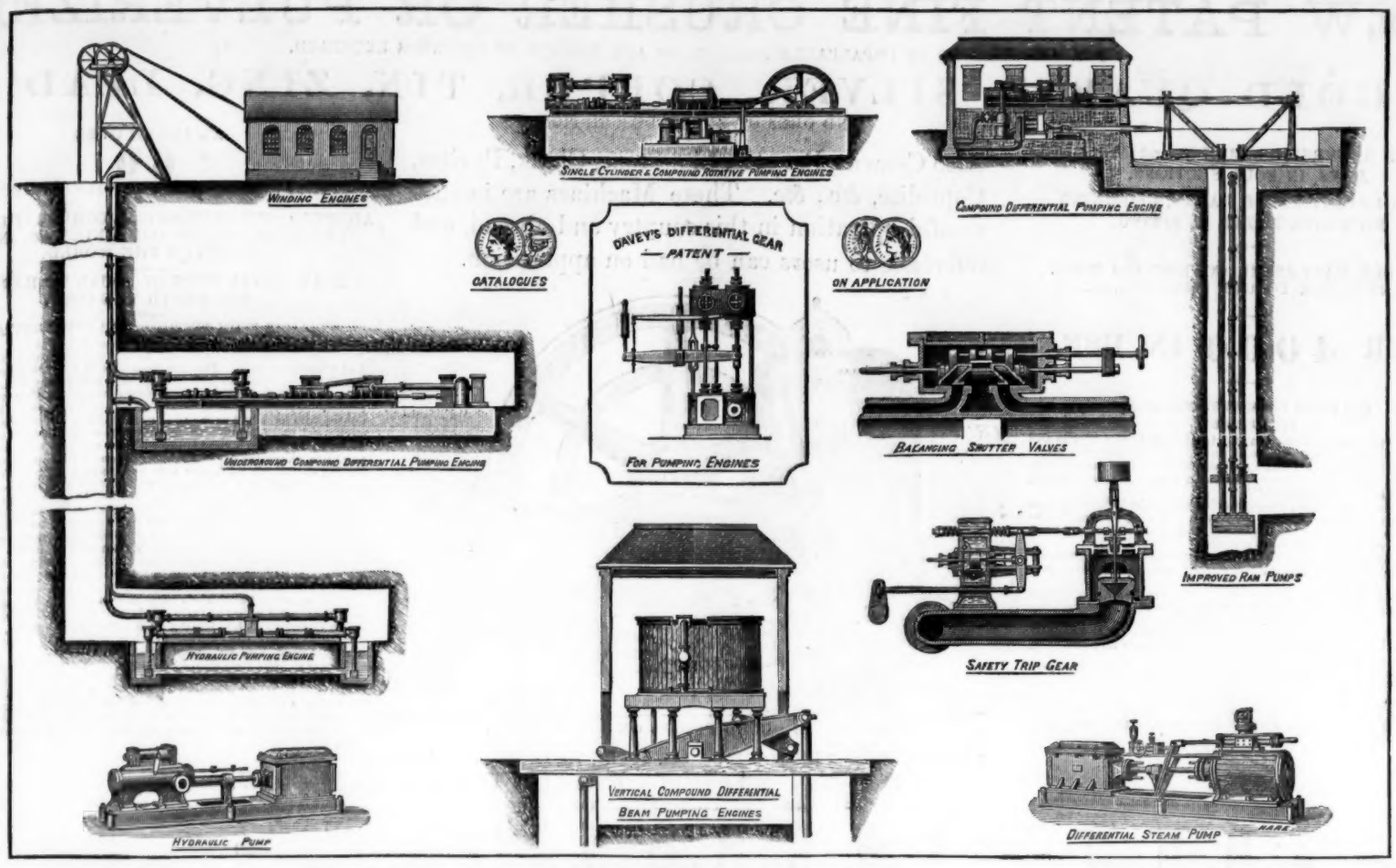


SUN FOUNDRY, LEEDS.

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING for High-Pressure Engines

The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
2nd August, 1884.

DEAR SIR,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,
T. F. EVANS,
Late H.M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

DEAR SIR,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,
G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

SIR,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Square.
" " ... ... Round.

To Mr. John Bell.
JOHN COLLETT, Director of Navy Contracts.

The Patent Block Packing is square, as Fig. 1 and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid. As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears the trade mark.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that ⅛ in. thick of incrustation causes a waste of 15 per cent. of coal; ¼ in., 60 per cent.; ⅜ in., 150 per cent. Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel. It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient. Sold in drums and casks bearing the Trade Mark, without which none is genuine.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction.

Sandwell Park Colliery, Smethwick, 1st February, 1884.

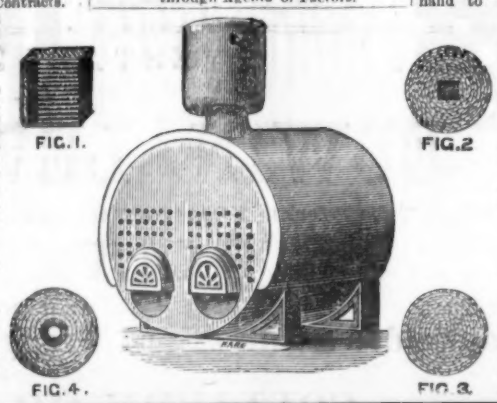
To Bell's Asbestos Works.

DEAR SIRS,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.—I am, dear Sirs, yours faithfully,
THOMAS WINTER, Colliery Engineer.

TRADE MARK.

BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.



BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

DEAR SIR,—It may interest you to know that we save exactly 40 per cent. in fuel through using your covering.

Yours truly, W. SANTO CRIMP, C.E., F.G.S.

The Tamar and Kit Hill Granite Company (Limited),
Gunnislake, Tavistock, 8th April, 1884.

Mr. John Bell, Southwark, S.E.

SIR,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully, W. J. CHALK, Assoc. M. Inst. C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from ⅛ in. to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and ½ millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.
Admiralty, Whitehall, S.W., 17th May, 1884.

SIR,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell.

JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT). This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

BELL'S "ASBESTOS LUBRICANT."

"REGD"

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

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Victoria Buildings, Deansgate, MANCHESTER. 11 and 13, St. Vincent Place, GLASGOW. 39, Mount Stuart Square, CARDIFF. 21, Ritter Strasse, BERLIN.

THE BLAKE-MARSDEN NEW PATENT IMPROVED STONE BREAKERS AND ORE CRUSHERS.

ORIGINAL PATENTEE AND ONLY MAKER

H. R. MARSDEN,

ALSO PATENTEE AND ONLY MAKER OF THE

NEW PATENT FINE CRUSHER OR PULVERIZER,

FOR REDUCING TO AN IMPALPABLE POWDER, OR ANY DEGREE OF FINENESS REQUIRED,

GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD

AND ORES OF EVERY DESCRIPTION

PATENT REVERSIBLE CURING and CRUSHING JAWS, IN FOUR SECTIONS,

WITH PATENT FACED BACKS, REQUIRING NO WHITE METAL IN FIXING.

CRUCIBLE CAST-STEEL CONNECTING RODS. RENEWABLE TOGGLE CUSHIONS, &c.

OVER **4000** IN USE.

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &c., &c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.

AWARDED OVER

60

FIRST-CLASS GOLD AND SILVER MEDALS.

ADOPTED BY THE PRINCIPAL CORPORATIONS, CONTRACTORS, MINING COMPANIES, &c., IN ALL PARTS OF THE WORLD.

ROAD METAL BROKEN EQUAL TO HAND, AT ONE-TENTH THE COST.

EXTRACTS FROM TESTIMONIALS.
PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

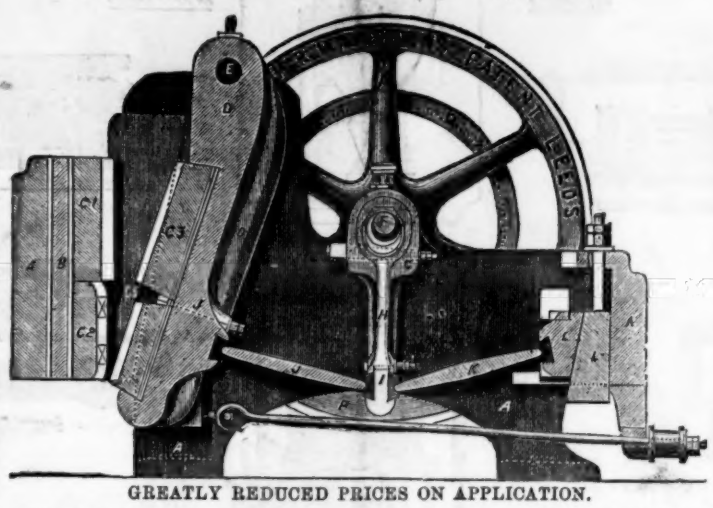
"In reply to your favour, I have much pleasure in informing you that the 12×3 Pulveriser we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverising that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20×5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried *by hand*, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."



GREATLY REDUCED PRICES ON APPLICATION.

EXTRACTS FROM TESTIMONIALS.—STONEBREAKER.

"I now order Three of your Stone Crushers, size 15 × 10, to be of your very best construction, and to include two extra sets of Jaws and Cheeks for each. The last two 24×13 machines you sent me which are at work in this colony, are doing very well. You will soon find that the railway contractors will adopt your machines in preference to the colonial ones—two of which I have. I know other contractors have had as many as nine of them, which have not given very good satisfaction. Once they know of yours thoroughly, I believe you will do a good trade with the colonies. For reference of the high character of your constructions you can refer to me as having used them with the very best results, both in New Zealand and this colony, and much prefer them to the colonial article, both in point of construction and less liability to go out of order. The material we are crushing is very hard blue stone, for railway ballast purposes. Push on with the order as quickly as possible; I do not think it necessary to have any engineering inspection. I have brought your machines prominently under the notice of all large contractors in this colony, likewise the Government. Many of the contractors have spoken to me in reference to their capabilities, and I could only tell them that they are by far and away the best and most economical I ever used. The very fact of me having purchased now Eleven from you at various intervals and various sizes, and two above 12 years ago, and having tried all the other makers, is sufficient guarantee of the capabilities and the working of your machines. Yours in every way surpass all others."

"Some of your testimonials do not give your machines half the due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in a quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) n a day than 200 men, and at 1-25th the cost."

FOR CATALOGUES, TESTIMONIALS, &c., APPLY TO THE SOLE MAKER,

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JOHN CAMERON'S

SPECIALITIES ARE HIS

STEAM PUMPS

FOR

COLLIERY PURPOSES.

Specially adapted for forcing Water any height

ALSO, FOR

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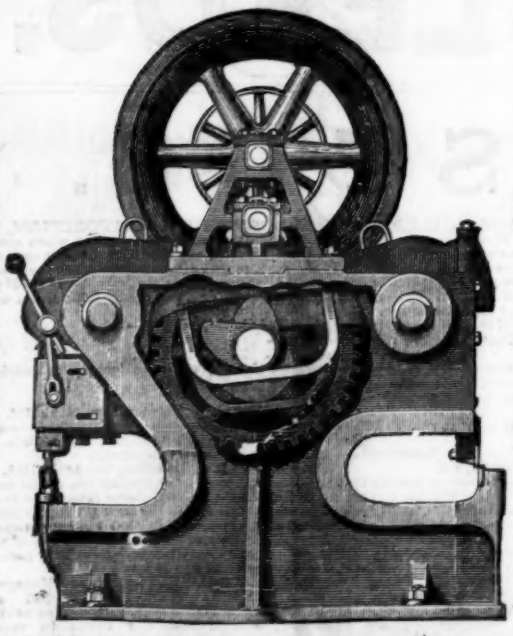
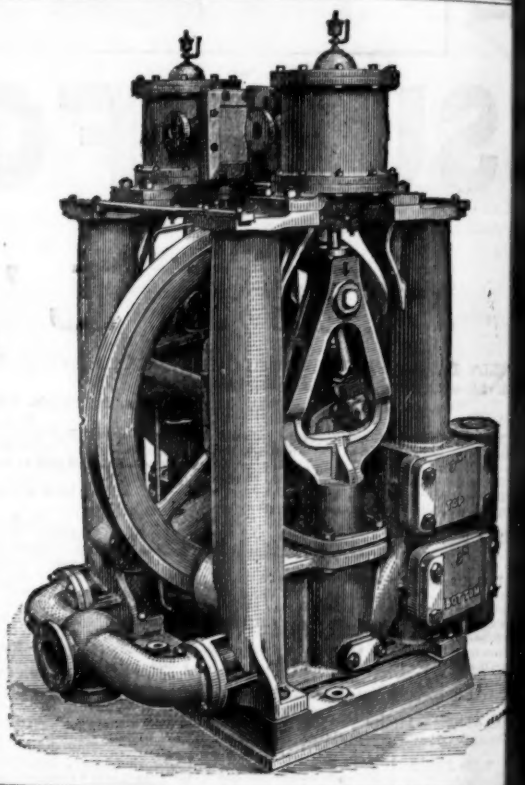
Of which he has made over 9000.

ALSO, HIS

PATENT CAM AND LEVER PUNCHING AND SHEARING MACHINES.

FLY-WHEELS ON BOTH SIDES.





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For NEWCASTLE and EAST COAST—E. BECKWITH AND CO., BONNERSFIELD, SUNDERLAND.

HEPBURN'S PUMP LEATHER WATERPROOF

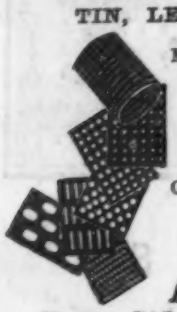
By a special method of preparation this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

HEPBURN AND GALE, LIMITED,
TANNERS AND CURRIERS,
LEATHER MILL BAND AND HOSE PIPE MANUFACTURERS,
LONG LANE, SOUTHWARK, LONDON.
Prize Medals, 1851, 1855, 1878, for
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.

PERFORATED SHEET METALS

FOR

TIN, LEAD AND COPPER MINES,



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MANUFACTURERS OF

Lapwelded & Buttwelded Wrought-iron, Steel, or Homogeneous Tubes

FOR EVERY

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J. WOOD ASTON AND CO., STOURBRIDGE

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Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES, FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions.

WELDED STEEL CHAINS { FOR CRANES, INCLINES, MINES, &c., MADE ALL SIZES.

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